SPECTRUMLABS.COM

Laboratory Product Catalog

Laboratory Dialysis

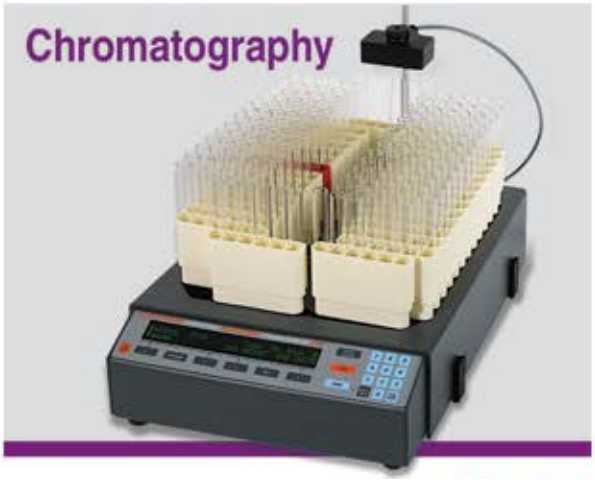
Ready-to-Use Dialysis

Laboratory Filtration

Tangential Flow Filtration

Labware

Chromatography



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Since 1970, Spectrum Laboratories has developed and manufactured innovative products for bioseparation and cell line management. Spectrum products are used for the filtration, isolation, purification and concentration of pharmaceuticals, diagnostics, food, beverages and industrial fluids. Spectrum pioneered the development of dialysis membranes and accessories, disposable hollow fiber filtration modules and systems and preparative low-pressure liquid chromatography products.

Our membranes and membrane filters are used for macrofiltration, microfiltration, ultrafiltration, diafiltration and dialysis. With over 2,000 products ranging from small disposable membrane filter modules to high volume systems, you can be certain we have a product for your application.

We continue to make significant investments in R&D to develop and provide new products and advance separation technology as a whole. Spectrum's team of membrane scientists, engineers, technical experts and quality control personnel is always available to support your separation application. Our dedicated OEM group is available to work with our customers on special projects.

Spectrum is committed to providing quality products to all our customers. All membrane products are shipped with a certificate of conformance. We also publish comprehensive validation guides with details and results of all quality control procedures.

Spectrum has grown to become a global company with corporate headquarters in Rancho Dominguez, California and manufacturing facilities in Rancho Dominguez, CA; Houston, TX and Dallas, TX. Our European sales offices are located in Breda, Netherlands and Paris, France. Our Asian sales offices are located in Otsu-City, Shiga Japan and Shanghai, China. Spectrum also supplies products world-wide through a network of international distributors.

We personally invite you and your colleagues to visit us, tour our manufacturing facilities and review our quality program. To arrange a site visit, please contact our Rancho Dominguez office at (310) 885-4600 or email us via our website at www.spectrumlabs.com.

Thank you for your business and we look forward to providing you with quality products in the future.

Sincerely,

The Staff of Spectrum Laboratories, Inc.

THIS CATALOG IS PRINTED ON RECYCLED PAPER

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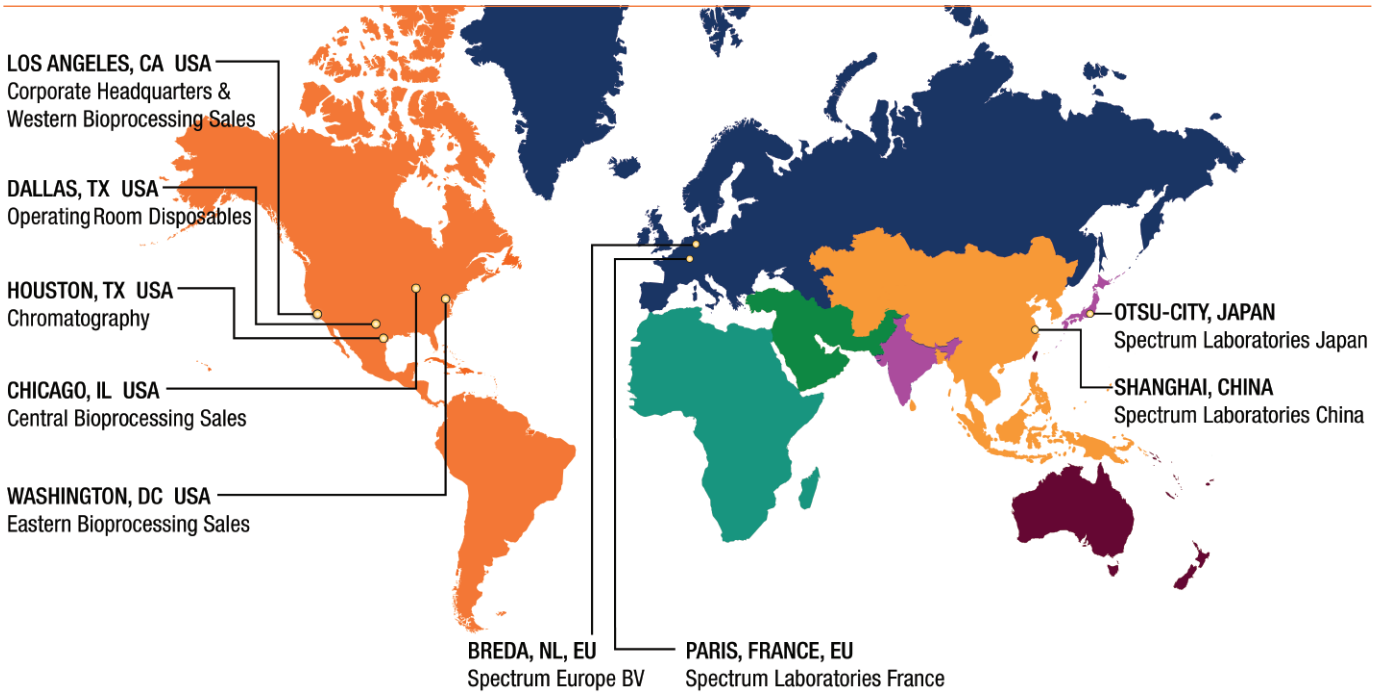

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No Other Warranty: Except for the express warranty set forth above, Spectrum grants no other warranties, express or implied, by statute or otherwise regarding the products, their fitness for any purpose, their quality, their merchantability, or otherwise.

Limitation of Liability: Spectrum's liability under the warranty shall be limited to a refund of the customer's original purchase price. In no event shall Spectrum be liable for the cost of procurement of substitute goods by the customer for any special, consequential or incidental damages for breach of warranty.

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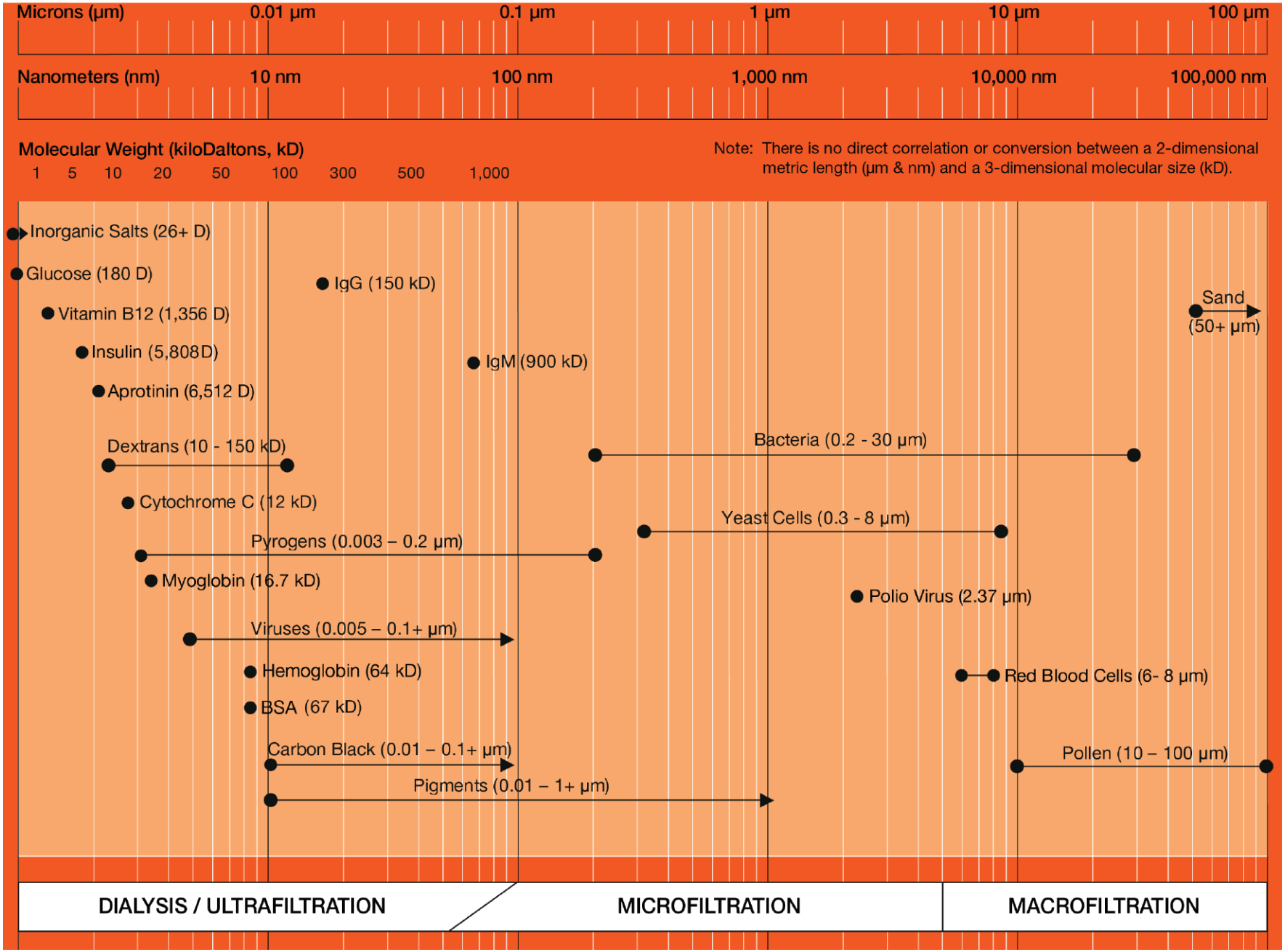
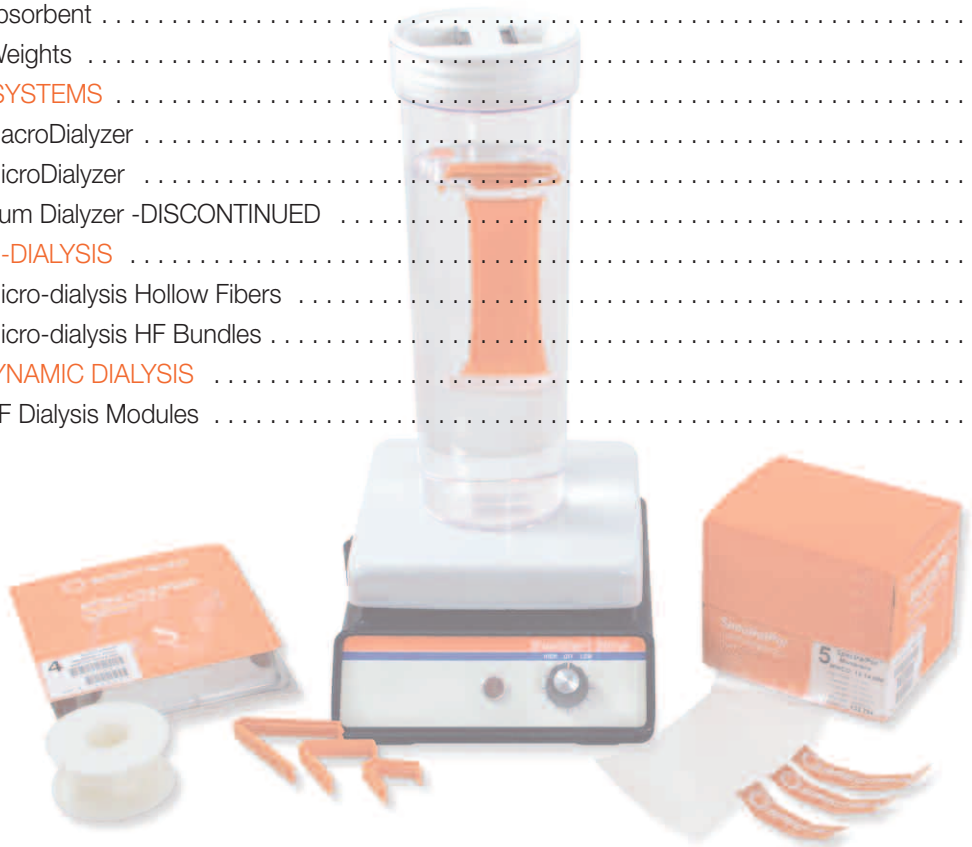
SPECTRUMLABS.COM Relative Size Chart





Fundamentals of Laboratory Dialysis

Dialysis is a simple process in which small solutes diffuse from a high concentration solution to a low concentration solution across a semi-permeable membrane until equilibrium is reached. Since the porous membrane selectively allows smaller solutes to pass while retaining larger species, dialysis can effectively be used as a separation technique based on size rejection. The conditions of dialysis can be controlled or manipulated to produce desired results for a variety of dialysis applications. The application depicts which Molecular Weight Cut Off (MWCO) yields the preferred molecular separation.

ADVANTAGES OF LAB DIALYSIS

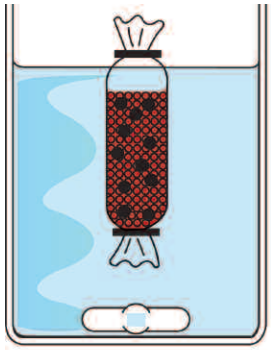
- Very Gentle Conditions
- Easy Operation
- Wide Range of Sample Volumes
- Many Membrane Types & MWCO's
- Inexpensive Materials
- Disposable Membranes & Devices

Typical Dialysis Applications

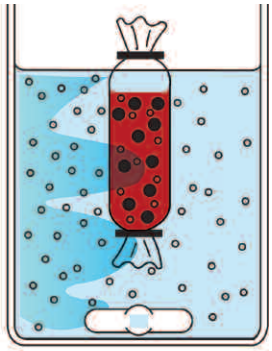
- Macromolecular Purification
- Solute Fractionation
- pH Change
- Buffer Exchange
- Electro-elution
- Protein Concentration
- Contaminant Removal
- Desalting
- Binding Studies

Selecting the Right Molecular Weight Cut Off (MWCO)

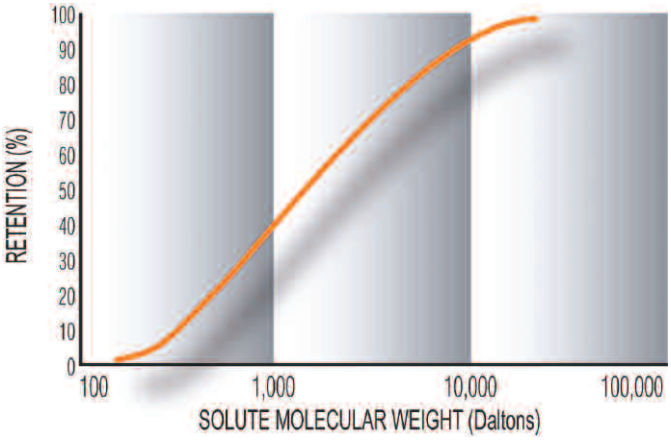
Since the dialysis membrane consists of a spongy matrix of cross-linked polymers, the pore rating referred to as Molecular Weight Cut Off (MWCO) is an indirect measure of the retention performance. More precisely, the membrane MWCO is determined as the solute size that is retained by at least 90%. However, since a solute's permeability is also dependent upon molecular shape, degree of hydration, ionic charge and polarity, it is recommended to select a MWCO that is 50-80% the size of the MW of the species to be retained and 100 times larger than the MW of the species intended to pass through.



Start Dialysis
(high concentration gradient)



End Dialysis
(equilibrium)



SPECTRUM DIALYSIS CHECK LIST

"THE DIALYSIS SHOP"... ON-LINE!

Spectrum provides the most comprehensive on-line product offering tailored to laboratory dialysis; including membranes, accessories and hardware. Spectrum's website also features product search and comparison tools and provides a wealth of technical information. Whether needing technical support, information or shopping, visit us at...

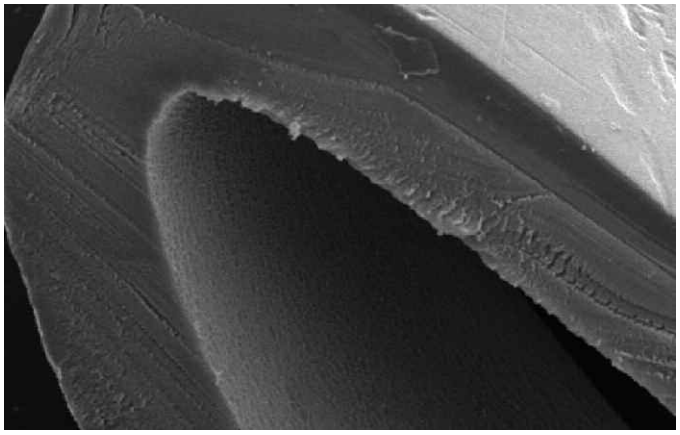
www.spectrumlabs.com

Spectrum® Dialysis Membrane

As the pioneer and leader in laboratory dialysis products, Spectrum offers the largest selection of dialysis membranes to meet the ever increasing and varied demands of the laboratory researcher. Keeping in mind MWCO, volume size, chemical compatibility, temperature, pH and solvent conditions; Spectrum has developed 2 fundamental grades of dialysis membranes, Standard and Biotech Grades, as well as 2 types of membranes, Regenerated Cellulose (RC) and Cellulose Ester (CE) to meet the demands of a large variety of dialysis applications.

Membrane Configurations

Depending on the membrane grade and type, Spectrum offers the largest assortment of membrane configurations: Tubing, Ready-to-Use Dialysis Devices (RDD),flat-sheet and hollow fiber. Being the most conventional configuration, dialysis tubing is available dry with glycerin, pre-wetted or pre-treated. Offering the ultimate in convenience, dialysis tubing is also available pre-assembled into 3 types of RDD: Float-A-Lyzer G2, Micro Float-A-Lyzer and Tube-A-Lyzer. Flat-sheet membranes are available in standard RC sheets and discs for use with various types of dialysis apparatuses and systems also available from Spectrum. Hollow Fiber membrane provides very large surface area for the dialysis of micro-volumes.



Selecting "the Right Membrane"

The key to a successful dialysis separation is using the RIGHT MEMBRANE under the right conditions. There are 6 steps to follow when selecting a membrane:

1. Select grade (Biotech or Standard) based on application.
2. Select type (CE or RC) based on chemistry.
3. Select membrane configuration based on application (tubing, RDD, flat-sheet system or hollow fiber microdialysis).
4. Select from among 18 MWCO's based on solute size.
5. Select from among 7 volume sizes (disposable device) or from among 22 flat widths (tubing) based on volume.
6. Select the membrane treatment preferred for your application.

Spectra/Por® Biotech Grade Membranes pg 14

Biotech membranes are specifically engineered for more critical separation constraints in which an ultrapure membrane with a precise MWCO is required. Since these synthetic membranes are manufactured using a process without metal salts, no pre-treatment or cleaning is required. Biotech tubings are available in 2 membrane types and dialysis devices are available in 1 membrane type:

Biotech Cellulose Ester (CE)	wide range of selectivity & purity	pg 14
Biotech Regenerated Cellulose (RC)	combined selectivity, purity & resistance	pg 14

For ultimate convenience and ease-of-use, Spectrum offers:

Biotech Ready-to-Use Dialysis Devices	small volumes & in-process sampling	pg 9

Spectra/Por® Standard Grade Membranes pg 16

Ideal for basic, multi-purpose dialysis, this low cost membrane can be used for a wide variety of dialysis applications in which only general separations are required and low level membrane impurities are of little consequence. The standard RC type is composed of natural cellulose regenerated from cotton linters for strength and durability.

Standard Regenerated Cellulose (RC)	broad range, low cost lab applications	pg 16

Comparison Table of Dialysis Membrane Properties

Membrane Grade:	Biotech		Standard
Membrane Type:	CE	RC	RC
MWCO (Daltons):	0.1-0.5K, 0.5-1.0K, 3.5-5K, 8-10K, 20K, 50K, 100K, 300K, 1000K	3.5-5K, 8-10K, 20K	1K, 2K, 3.5K 8K, 6-8K, 10K 12-14K, 15K 25K, 50K
Physical Properties:	Opaque Rigid Hydrophilic	Opaque Flexible Hydrophilic	Clear Flexible Hydrophilic
Organic Resistance:	Fair	Good	Good
pH Range:	2 – 9	2 – 12	2 – 12
Temperature Limit:	37 ºC	60 ºC	121 ºC (Autoclavable)
Flat Sheet:	Not Available	Not Available	Symmetric Porosity
Recommended Closures:	Universal only	Universal only	Universal or Spectra/Por

For more help selecting the RIGHT MEMBRANE, go to **www.spectrumlabs.com**

Biotech Ready-to-Use Dialysis Devices (RDD)

Easy Dialysis of 100 µL - 30 mL Volumes

Revolutionizing laboratory dialysis, Spectrum offers Biotech Ready-to-Use Dialysis Devices with a broad range of precise MWCO's and all the needed accessory components included. No need for closures, knots, additional buoys or pontoons, weights, etc. There are 3 types of Spectra/Por disposable dialysis devices, the Float-A-Lyzer G2, the Micro Float-A-Lyzer and the Tube-A-Lyzer. All consist of a volume-specific length of ultra-pure biotech grade CE tubing with a re-sealable cap at one end and sealed closed at the other. Follow 3 easy steps for using all types of Biotech RDD's:

QUICK & EASY!

1. Open screw cap.
2. Load sample with pipette or syringe.
3. Close cap and dialyze!

Only Spectrum's dialysis devices with re-sealable screw caps allow in process sample testing without struggling with closures, leaking knots, needle punctures and leaking perforated septums. Eliminating the frustrations typically associated with dialysis tubing and cassette type devices, Biotech Ready-to-Use Dialysis Devices are...

SAFE & CONVENIENT!

- Superior Handling & Leak Protection
- Ready-to-Use & Complete
- 95-98% Sample Recovery
- Volume Specific Dilution Control
- Highest Membrane Purity

Float-A-Lyzer® G2

Micro Float-A-Lyzer®

Tube-A-Lyzer®

Comparison of Ready-to-Use Dialysis Devices

	Spectra/Por®: Float-A-Lyzer® G2	*Spectra/Por®:* Micro Float-A-Lyzer®	*Spectra/Por®:* Tube-A-Lyzer®	Other: Cassette-type Device
Easy Handling	YES	YES	YES	YES
Accessories	Included	Included	Not Included	Not Included
Membrane Type	Biotech CE	Biotech CE	Biotech CE	Standard RC
Heavy Metals & Sulfides	NO	NO	NO	YES
Membrane Prep Required	NO	NO	NO	YES
Loading & Recovery	Disposable pipette (included)	Syringe (no needle)	Peristaltic Pump	Syringe & needle
Leakage Risks	None	None	None	Membrane puncture, perforated septum
Number of Sizes	3	2	2	7
Sample Dilution	NO	NO	NO	YES
Available MWCO's	9	7	6	4

Spectra/Por® Float-A-Lyzer® G2

Ready-to-Use Features

PP Screw-on cap:	Open & close for in-process sampling Color-coded for MWCO
Silicon O-ring:	Leak proof & re-sealable
Top/Bottom Piece:	Durable Polycarbonate
Membrane:	Ultra-pure with 3 volume specific sizes
Floatation Ring:	Device body inserts through center for buoyancy
Potting:	Polyurethane
Sample Loading:	Disposable pipette for 5 & 10 ml (included) Micropipettor for 1 ml (not included)

Product Specifications

Membrane type:	Biotech grade Cellulose Ester (CE)
9 MWCO's:	0.1 – 0.5 kD, 0.5 – 1.0 kD, 3.5 - 5 kD, 8 - 10 kD, 20 kD, 50 kD, 100 kD 300 kD & 1000 kD
Packaging:	12/pkg

Dimensions

3 Volume Sizes:	1 ml	5 ml	10 ml
Nominal Length:	5 cm	10 cm	16 cm
Membrane Diameter:	10 mm	10 mm	10 mm
Top Piece Diameter:	23 mm	23 mm	23 mm
Floatation Ring:	38 mm	38 mm	38 mm

Ordering Information: Spectra/Por® Float-A-Lyzer® G2

		MWCO		Sample Volume Sizes			Qty
		(kD)	Color Code	1 ml	5 ml	10 ml	
Spectra/Por® Float-A-Lyzer® G2	Biotech CE	0.1 - 0.5	Green	G235025	G235049	G235061	12/pkg
		0.5 - 1.0	Orange	G235027	G235051	G235063	
		3.5 - 5	Black	G235029	G235053	G235065	
		8 - 10	Yellow	G235031	G235055	G235067	
		20	Red	G235033	G235057	G235069	
		50	Violet	G235034	G235058	G235070	
		100	Blue	G235035	G235059	G235071	
		300	Amber	G235036	G235060	G235072	
		1000	Pink	G235037	G235062	G235073	

Related Product:

Spectra/Gel® Absorbent pg 23

Easily concentrate samples in Ready-to-Use Dialysis Devices

Spectra/Por® Micro Float-A-Lyzer®

Ready-to-Use Features

PP Luer-Lok™ cap: Open & close for in-process sampling
Color-coded for MWCO
Leak proof & re-sealable
Body Piece: Polycarbonate, seals top/bottom ends of membrane, self-buoyant
Membrane: Ultra-pure with 2 volume specific sizes
Potting: Polyurethane
Sample Loading: Syringe (1 ml syringe included)

Product Specifications

Membrane type: Biotech grade Cellulose Ester (CE)
7 MWCO's: 0.1 – 0.5 kD, 0.5 – 1.0 kD, 3.5 – 5 kD, 8 – 10 kD, 20 kD, 50 kD & 100 kD
Packaging: 12/pkg

Dimensions

2 Volume Sizes:	100-200 µl	400-500 µl
Height:	4.4 cm	6.3 cm
Width:	4.5 cm	4.5 cm
Thickness:	1.9 cm	1.9 cm
Membrane Flat Width:	10 mm	10 mm
Membrane Diameter:	6.4 mm	6.4 mm

Ordering Information: Spectra/Por® Micro Float-A-Lyzer®

		MWCO		Sample Volume Sizes		Qty
		(kD)	Color Code	100-200 µl	400-500 µl	
Spectra/Por® Micro Float-A-Lyzer®	Biotech CE	0.1 - 0.5	Green	F235049	F235061	12/pkg
		0.5 - 1.0	Orange	F235051	F235063	
		3.5 - 5	Black	F235053	F235065	
		8 - 10	Yellow	F235055	F235067	
		20	Red	F235057	F235069	
		50	White	F235058	F235070	
		100	Blue	F235059	F235071	

Spectra/Por® Tube-A-Lyzer®

Disposable & Ready-to-Use Dynamic Dialysis Device

Reduces Dialysis from Days to Hours

Spectrum's Tube-A-Lyzer is a ready-to-use, gentle separation device that combines convenience and disposability with the efficiency of dynamic dialysis to significantly reduce dialysis from 1-2 days to 4 -12 hours. This self-contained, disposable device incorporates a semi-permeable membrane tubing that separates the sample chamber from the surrounding flow-through buffer chamber. The Biotech Grade Cellulose Ester (CE) membrane chamber is available in 6 MWCO's and in 2 volume sizes. The sample port provides easy access for loading, recovering and in-process testing. The housing is designed to be a flow-through dialysate chamber that can be connected to a buffer source and a waste collection vessel or discharging directly to drain.

Mounted on Spectrum's KrosFlo Research I pump and integrated stand (or any conventional stand), the Tube-A-Lyzer can be operated as a single unit or in parallel when multiple units are combined using a coupling bracket (sold separately) into a multi-unit device.

ADVANTAGES OF DYNAMIC DIALYSIS

- **Faster dialysis; 4-12 hours**
- **Ready-to-Use and disposable: no preparation required**
- **Easy sample loading, testing & recovery**
- **Prevents membrane polarization & fouling**
- **No heavy metals & sulfide contaminants**
- **95-98% Recovery**

Features of Spectra/Por® Tube-A-Lyzer®

CE Membrane:	6 MWCO's: 0.1-0.5, 3.5-5, 8-10, 20, 50 & 100 kD
Sample Chamber:	2 Volume sizes: 8-10 ml & 25-30 ml
	Biotech Grade Cellulose Ester (CE) Membrane
	Polycarbonate top and bottom piece
	Polyurethane potting
	Female Luer-Lok™ sample port
	Polypropylene male Luer-Lok™ cap
Buffer Chamber:	Polycarbonate housing & end caps
	6 mm (3/16 inch) hose-barb inlet / outlet port
Dynamic Pump Rate:	10-20 ml/min (should be optimized for application)

Dimensions

Sample Volume	Buffer Volume	Total Length	Total Diameter	Membrane Length	Membrane Diameter
8-10 ml	50-55 ml	23 cm	2.2 cm	14-16 cm	1.0 cm
25-30 ml	120-130 ml	50 cm	2.2 cm	36-38 cm	1.0 cm

Ordering Information: Spectra/Por® Tube-A-Lyzer®

		MWCO (kD)	Sample Volume Sizes 8-10 ml	Sample Volume Sizes 25-30 ml	Qty
Spectra/Por® Tube-A-Lyzer®	Biotech CE	0.1 - 0.5	137002	137042	3/pkg
		3.5 - 5	137004	137044	
		8 - 10	137006	137046	
		20	137008	137048	
		50	137009	137049	
		100	137010	137050	
		Part No.	**Description**		
	Accessories	137100	Tube-A-Lyzer Sample Loading Kit (includes 3 syringes (30 cc), 3 dispensing tips & 2 coupling brackets)		
		137110	Replacement Dispensing Tips, 12/pkg		
		ACTU-E16-25N	Extended Life Silicone Tubing, 1/8 in. (3.1 mm) ID, 25 ft (7.6 m)		

Related Product:
KrosFlo® Research I Pump & Stand pg 67

Spectra/Por® Biotech Grade Membranes:

Cellulose Ester (CE) & Regenerated Cellulose (RC)

Only Spectrum offers Biotech Grade dialysis membrane for those critical applications requiring stringent MWCO's and membrane purity. Since these synthetic membranes are made using a process free of heavy metal contaminants and sulfides, they are ultra-pure and require no cleaning or pre-treatment. Simply rinse with DI water, apply Universal Closures* and load sample! Spectrum offers 2 types of Biotech grade membrane to meet the different demands of laboratory dialysis applications: Cellulose Ester (CE) & Regenerated Cellulose (RC).

ADVANTAGES OF BIOTECH MEMBRANES

- Ultrapure for critical separations
- Rigidly controlled porosity
- 2 types available for different applications (CE & RC)
- Large MWCO selection (100 - 1,000,000 Daltons)

Biotech Cellulose Ester (CE) Membrane

Biologically inert & ultra-pure, Biotech CE Membrane offers the largest and best selection of pore ratings and sizes for isolating ionic species and macromolecular purifications. Of the 2 types, Biotech CE is more sensitive to harsh conditions and solvents. In general, CE membrane will tolerate weak or dilute acids & bases as well as mild alcohols with only a slight change to the MWCO. Exposure to organic solvents will damage the CE membranes. Biotech CE should only be used with pH 2–9 & temp 4–37°C. CE dialysis tubing is available in 9 concise MWCO's.

Biotech Regenerated Cellulose (RC) Membrane

Synthetic Biotech RC Membrane is crafted from a regeneration process that yields improved physical tolerances and chemical compatibilities with the same high purity and rigidly controlled MWCO's as Biotech CE. RC Membrane can be used with concentrated-weak acids & bases, dilute-strong acids & bases, most alcohols and some mild or dilute organic solvents. Exposure to strong polar or organic solvents may damage RC membranes. Biotech RC can be used with pH 2–12 & temp 4–60°C. Biotech RC is available in dialysis tubing with 3 concise MWCO's.

*Universal Closures required for use with Biotech Tubing

Biotech Dialysis Tubing

Product Specifications: 2 Membrane Types

Cellulose Ester (CE)

Properties: Hydrophilic, symmetric porosity
9 MWCO's: 0.1 – 0.5 kD, 0.5 – 1 kD, 3.5 – 5 kD, 8 – 10 kD, 20 kD, 50 kD, 100 kD, 300 kD & 1000 kD
4 Flat Widths: 10 mm, 16 mm, 24 mm & 31 mm
Qty/Pkg: 10 m/roll, wet in 0.05% sodium azide

Regenerated Cellulose (RC)

Properties: Hydrophilic, symmetric porosity
3 MWCO's: 3.5 – 5 kD, 8 – 10 kD & 20 kD
2 Flat Widths: 10 mm & 16 mm
Qty/Pkg: 5 m/roll, dry with glycerin

NEW! Biotech Dialysis Trial Kits

Provides shorter length of Biotech CE or RC Dialysis tubing for membrane/application evaluation.

Product Specifications: 2 Membrane Types

Kit Includes: Biotech dialysis tubing (CE or RC)
2 tubing closures
5 opening picks

Cellulose Ester (CE)

Properties: Hydrophilic, symmetric porosity
9 MWCO's: 0.1 – 0.5 kD, 0.5 – 1 kD, 3.5 – 5 kD, 8 – 10 kD, 20 kD, 50 kD, 100 kD, 300 kD & 1000 kD
1 Flat Width: 16 mm
Qty/Kit: 1 m/roll, wet in 0.05% sodium azide

Regenerated Cellulose (RC)

Properties: Hydrophilic, symmetric porosity
3 MWCO's: 3.5 – 5 kD, 8 – 10 kD & 20 kD
1 Flat Width: 16 mm
Qty/Kit: 0.5 m/roll, dry with glycerin

Ordering Information: Biotech Dialysis Tubing & Trial Kits

		Tubing Dimensions: Flat Width / Diameter / Volume per length						NEW! Dialysis Trial Kits	
		MWCO	10 mm	16 mm	24 mm	31 mm	Qty	MWCO	Flat Width: 16 mm
			6.4 mm	10 mm	15 mm	20 mm			Diameter: 10 mm
		(kD)	0.32 ml/cm	0.79 ml/cm	1.8 ml/cm	3.1 ml/cm		(kD)	Vol/length: 0.79 ml/cm
Biotech Membrane Dialysis Tubing	CE Tubing	0.1 - 0.5	131048	131054	131057	131060	10 m (wet)	0.1 - 0.5	131054T
		0.5 - 1.0	131084	131090	131093	131096		0.5 - 1.0	131090T
		3.5 - 5	131192	131198	131201	131204		3.5 - 5	131198T
		8 - 10	131264	131270	131273	131276		8 - 10	131270T
		20	131336	131342	131345	131348		20	131342T
		50	131372	131378	131381	131384		50	131378T
		100	131408	131414	131417	131420		100	131414T
		300	-	131450	-	-		300	131450T
		1000	-	131486	-	-		1000	131486T
	RC Tubing	3.5 - 5	133192	133198	-	-	5 m (dry)	3.5 - 5	133198T
		8 - 10	133264	133270	-	-		8 - 10	133270T
		20	133336	133342	-	-		20	133342T

Standard Grade RC Membrane: Spectra/Por® 1 - 7

Because Standard Regenerated Cellulose (RC) is composed of natural cellulose polymer from cotton linters, these membranes are perfectly suited for a broad range of laboratory dialysis. This clear and flexible membrane type with symmetric porosity is economical and sturdy; ideal for desalting, buffer exchanges, macromolecular purifications and other general applications. Possessing a broad chemical compatibility range, Standard RC membranes can be used with dilute strong acids and bases, concentrated weak acids and bases, most alcohols and some mild or dilute organic solvents, including DMSO. Exposure to some strong organic solvents may damage RC membranes. Standard RC can be used with pH 2–12 & temperatures 4–121ºC. While the low level heavy metal impurities in Standard RC typically pose no problem, they can easily be eliminated using Spectrum's Heavy Metal Cleaning Solution. Standard RC Membrane is available in rolls of dialysis tubing (dry or pre-treated), dialysis trial kits, ready-to-use dialysis sacks & flat sheet (discs or square sheets).

There are 7 different categories of Standard RC Membrane, Spectra/Por 1 – 7, each possessing unique desirable properties to meet different application needs:

Spectra/Por® 1 Dialysis Membrane
MWCO: 6,000 – 8,000 Daltons
Properties: Standard RC with glycerol for general dialysis

Spectra/Por® 2 Dialysis Membrane
MWCO: 12,000 – 14,000 Daltons
Properties: Standard RC with glycerol in special membrane dimension and/or high permeability

Spectra/Por® 3 Dialysis Membrane
MWCO: 3,500 Daltons
Properties: Standard RC with glycerol for general dialysis

Spectra/Por® 4 Dialysis Membrane
MWCO: 12,000 – 14,000 Daltons
Properties: Standard RC with glycerol for general dialysis

Spectra/Por® 5 Dialysis Membrane
MWCO: 12,000 – 14,000 Daltons
Properties: Standard RC with glycerol reinforced with porous paper for large volume and weight

Spectra/Por® 6 Dialysis Membrane
MWCO: 1, 2, 3.5, 8, 10, 15, 25 & 50 kD
Properties: Standard RC in 0.05% sodium azide, pre-wetted

Spectra/Por® 7 Dialysis Membrane
MWCO: 1, 2, 3.5, 8, 10, 15, 25 & 50 kD
Properties: Standard RC in 0.05% sodium azide, pre-cleaned to minimize heavy metals & sulfides

Spectra/Por® Standard RC Dialysis Tubing (Dry Rolls)

Multi-purpose dialysis tubing ideal for general dialysis for a variety of applications and volumes.

Product Specifications

Membrane Type	MWCO	15 Flat Widths (mm)
Spectra/Por 1	6 – 8 kD	10, 23, 32, 40, 50, 100, 120
Spectra/Por 2	12 – 14 kD	10, 25, 45, 105, 120
Spectra/Por 3	3.5 kD	18, 45, 54
Spectra/Por 4	12 – 14 kD	10, 25, 32, 45, 75
Spectra/Por 5	12 – 14 kD	75, 140

Properties: Hydrophilic, symmetric porosity
Quantity: 15 or 30 m roll (depending on Type and Flat Width)
Packaging: Dry with glycerol (rinse out with water)

Related Products: *Tubing Closures (Universal & Spectra/Por®)* pg 20
Heavy Metal Cleaning Solution pg 23

NEW! Spectra/Por® Standard RC Dialysis Trial Kits

Provides 5 m lengths of standard RC Dialysis tubing for membrane application evaluation

Product Specifications

Kit Includes: 5 m roll of Spectra/Por 1, 2 or 3
1 standard Spectra/Por Closure
1 weighted Spectra/Por Closure
5 opening picks

Membrane Type	MWCO	6 Flat Widths (mm)
Spectra/Por 1	6 – 8 kD	32 & 50
Spectra/Por 2	12 – 14 kD	25 & 45
Spectra/Por 3	3.5 kD	18 & 54

Ordering Information: Spectra/Por® 1, 2, 3, 4 & 5 Tubing & Dialysis Kits

		MWCO	Flat Width (mm)	Diameter (mm)	Vol/Length (ml/cm)	Part No. 15 m/roll	Part No. 30 m/roll	NEW Trial Kits 5 m/roll
Standard RC Membrane Dialysis Tubing	Spectra/Por® 1	6 - 8 kD	10	6.4	0.32	132645	-	-
			23	14.6	1.7	-	132650	-
			32	20.4	3.3	-	132655	132655T
			40	25.5	5.1	-	132660	-
			50	32	7.9	-	132665	132665T
			100	64	32	132670	-	-
			120	76	46	132675	-	-
	Spectra/Por® 2	12 - 14 kD	10	6.4	0.32	132676	-	-
			25	16	2.0	132678	-	132678T
			45	29	6.4	132680	-	132680T
			105	67	34	132682	-	-
			120	76	46	132684		-
	Spectra/Por® 3	3.5 kD	18	11.5	1.1	132720	-	132720T
			45	29	6.4	132724	-	-
			54	34	9.3	132725	-	132725T
	Spectra/Por® 4	12 - 14 kD	10	6.4	0.32	-	132697	-
			25	16	2.0	-	132700	-
			32	20.4	3.3	-	132703	-
			45	29	6.4	-	132706	-
			75	48	18	132709	-	-
	Spectra/Por® 5	12 - 14 kD	75	48	18	132754	-	-
			140	89	62	132757	-	-

Standard RC Ready-to-Use Dialysis Sacks

Designed for the general dialysis of larger sample volumes, the Ready-to-Use Sack consists of a 60 cm length of Spectra/Por 1, 2, 3 or 4 tubing, sealed at one end with a Spectra/Por Closure and a funnel attached to the other for easy filling. Simply fill, apply closure & cut.

Product Specifications

4 Membrane Types:	Spectra/Por 1, 2, 3 & 4
2 Volume Sizes:	1 – 40 ml, 50 – 400 ml
Properties:	Hydrophilic, symmetric porosity
Packaging:	Wet in 0.05% sodium azide
Quantity:	10/pkg

Ordering Information: Spectra/Por® 1, 2, 3, 4 & 5 Sacks

		MWCO	Flat Width (mm)	Diameter (mm)	Volume (ml)	Part No.	Qty
Standard RC Membrane Ready-to-Use Sacks	Spectra/Por® 1	6 - 8 kD	23	14.6	1 to 40	132651	10/pkg
			50	32	50 to 400	132666	
	Spectra/Por® 2	12 - 14 kD	25	16	1 to 40	132679	
			45	29	50 to 400	132681	
	Spectra/Por® 3	3.5 kD	18	11.5	1 to 40	132721	
			54	34	50 to 400	132726	
	Spectra/Por® 4	12 - 14 kD	25	16	1 to 40	132701	
			45	29	50 to 400	132707	

Standard RC Dialysis Discs & Sheets

Pre-cut membrane discs for use with Spectra/Por MacroDialyzers and Equilibrium Dialyzers. Cut square membrane sheets to use with Spectra/Por MicroDialyzer or as needed for a variety of dialysis equipment.

Product Specifications

5 Membrane Types:	Spectra/Por 1, 2, 3, 4 & 5
3 Disc Diameters:	33 mm, 47 mm, 100 mm (used with Macro & Eq. Dialyzer)
Sheet Size:	(refer to ordering information)
Properties:	Hydrophilic, symmetric porosity
Packaging:	Dry with glycerol (rinse out with water)
Quantity:	50/pkg (discs), 25/pkg (sheets)

Related Products: *MacroDialyzer & Equilibrium Dialyzer* pg 24-26

Ordering Information: Spectra/Por® 1, 2, 3, 4 & 5 Discs & Sheets

		MWCO	Disc Diameter 33 mm	47 mm	100 mm	Qty	Sheet (Dimensions - mm)	Qty
Standard RC Membrane Dialysis Discs & Sheets	Spectra/Por® 1	6 - 8 kD	132478	132476	132474	50 discs/pkg	132677 (240 x 240)	25 sheets/pkg
	Spectra/Por® 2	12 - 14 kD	132482	132480	132477		132686 (200 x 200)	
	Spectra/Por® 3	3.5 kD	132488	132486	132484		132723 (108 x 108)	
	Spectra/Por® 4	12 - 14 kD	132498	132496	132494		132712 (150 x 150)	
	Spectra/Por® 5	12 - 14 kD	-	-	-		132759 (275 x 275)	

Standard RC Dialysis Tubing, Pre-treated (Wet Rolls)

Multi-purpose dialysis tubing with more MWCO's available. Pre-wetted Spectra/Por 6 tubing is ready-to-use, not requiring soaking to remove glycerol. Spectra/Por 7 is further pre-cleaned to minimize trace levels of heavy metals & sulfides.

Product Specifications: 2 Treatment Types

Spectra/Por® 6: Pre-wetted
8 MWCO's: 1 kD, 2 kD, 3.5 kD, 8 kD, 10 kD, 15 kD, 25 kD & 50 kD
13 Flat Widths: 8 mm, 10mm, 12 mm, 18 mm, 24 mm, 28 mm, 32 mm, 34 mm, 38 mm, 40 mm, 45 mm, 50 mm & 54 mm
Qty & Pkg: 10 m roll, wet in 0.05% sodium azide

Spectra/Por® 7: Pre-cleaned to reduce trace-level contaminants
8 MWCO's: 1 kD, 2 kD, 3.5 kD, 8 kD, 10 kD, 15 kD, 25 kD & 50 kD
12 Flat Widths: 8 mm, 12 mm, 18 mm, 24 mm, 28 mm, 32 mm, 34 mm, 38 mm, 40 mm, 45 mm, 50 mm & 54 mm
Qty & Pkg: 5 m roll, wet in 0.05% sodium azide

Ordering Information: Spectra/Por® 6 & Spectra/Por® 7 Tubing

	MWCO (kD)	Flat Width (mm)	Diameter (mm)	Volume/Length (ml/cm)	Spectra/Por® 6 (pre-wetted)	Spectra/Por® 7 (pre-cleaned)
Standard RC Membrane Pre-treated Tubing	1	18	11.5	1.1	132636	132103
		38	24	4.6	132638	132104
		45	29	6.4	132640	132105
	2	18	11.5	1.1	132620	132107
		38	24	4.6	132625	132108
		45	29	6.4	132633	132109
	3.5	18	11.5	1.1	132590	132110
		45	29	6.4	132592	132111
		54	34	9.3	132594	132112
	8	8	5.1	0.20	128056	128356
		12	7.5	0.45	132579	132113
		18	11.5	1.1	128058	128358
		24	15	1.8	132580	132114
		32	20.4	3.3	132582	132115
		40	25.5	5.1	132584	132116
		50	32	7.9	132586	132131
	10	8	5.1	0.20	128106	128406
		12	7.5	0.45	132570	132117
		18	11.5	1.1	128118	128418
		24	15	1.8	132572	132118
		32	20.4	3.3	132574	132119
		45	29	6.4	132576	132120
	15	8	5.1	0.20	128156	128456
		12	7.5	0.45	132560	132121
		18	11.5	1.1	128158	128458
		24	15	1.8	132562	132122
		32	20.4	3.3	132564	132123
		45	29	6.4	132566	132124
	25	8	5.1	0.20	128206	128506
		12	7.5	0.45	132550	132125
		18	11.5	1.1	128218	128518
		24	15	1.8	128224	128524
		28	18	2.5	132552	132126
		34	22	3.7	132554	132127
	50	10	6.4	0.32	132539	-
		12	7.5	0.45	132540	132128
		28	18	2.5	132542	132129
		34	22	3.7	132544	132130
				Qty	10 m	5 m

Dialysis Tubing Closures

Using resealable closures is the preferred method for sealing dialysis tubing without the risk of leaking. Opening and resealing tied knots is difficult and often results in damaged, leaking membranes. Spectrum offers two classes of Dialysis Tubing Closures: Universal Closures for use with all tubing membrane types and Spectra/Por Closures for use only with Standard Grade RC tubing. Specialized Spectra/Por Closures also offer additional functional benefits.

- Leak-proof & Re-sealable
- 2 Classes of Closures (Universal & Spectra/Por®)
- 3 Functional Types & 1 Paired Combination

For best results, select a pair of closures that has a sealing width 4 to 10 mm longer than the flat width of the dialysis tubing. This assures a proper seal without membrane tearing or leaking.

Universal Closures

Specially designed with gentle sealing ridges, Universal Closures are the ideal all-purpose closure that create a reliable seal for all membrane grades, types and thicknesses of tubing. Available in a variety of colors for easy sample identification.

Product Specifications

Functional Benefit:	Universal, seals all tubing membrane types
Membrane Types:	Biotech CE & RC; Standard RC
4 Sealing Widths:	50 mm, 70 mm, 110 mm, 150 mm
6 Colors:	White, Red, Yellow, Blue, Green, Black
Qty:	10/pkg
Material:	Nylon
Temperature:	0 – 90 °C
Sterilization:	Gamma irradiation or ethylene oxide (not autoclavable)

Ordering Information: Universal Closures

		Color	Closure Sealing Width 50 mm	70 mm	110 mm	150 mm	Qty
Universal Closures	Required for Biotech Grade RC & CE Dialysis Tubing	White	142150	142170	142110	142250	10/pkg
		Red	142152	142172	142112	142252	
		Yellow	142153	142173	142113	142253	
		Blue	142154	142174	-	-	
		Green	142155	142175	-	-	
		Black	142156	142176	-	-	

Spectra/Por® Closures

3 functional types & one pair combination for use with Standard RC.

Standard Closure Type

Since Spectra/Por Standard Closures float, they aid in buoyancy and vertical orientation when applied to the tubing top end. Autoclavable and available in a variety of colors for easy sample identification.

Product Specifications

Functional Benefit: Sample buoyancy & vertical orientation
Membrane Types: Standard RC only
5 Sealing Widths: 12 mm, 23 mm, 35 mm, 55 mm, 75 mm
4 Colors: orange, white, green, blue
Qty: 10/pkg
Material: Polypropylene
Temperature: 0 – 121ºC (autoclavable)

Weighted Closure Type

Autoclavable, Spectra/Por Weighted Closures encase an acid-washed, fluorocarbon coated, stainless steel bar. When applied to the bottom end of the dialysis tubing, the Weighted Closure acts like an anchor to maintain a vertical orientation of the sample.

Product Specifications

Functional Benefit: Weighted for vertical sample orientation
Membrane Types: Standard RC only
5 Sealing Widths: 12 mm, 23 mm, 35 mm, 55 mm, 75 mm
1 Color: White
Qty: 10/pkg
Material: Polypropylene
Temperature: 0 - 121ºC (autoclavable)

Magnetic Closure Type

Autoclavable, Spectra/Por Magnetic-Weighted Closures contain a magnetic fluorocarbon coated stainless steel bar, eliminating the need for conventional stir bars. Applied to the bottom end of the dialysis tubing, this closure provides complete submersion and gentle rotation of the sample on a stir plate.

Product Specifications

Functional Benefit: Weighted & magnetic for submersion & stirring
Membrane Types: Standard RC only
4 Sealing Widths: 23 mm, 35 mm, 55 mm, 75 mm
1 Color: Red
Qty: 2/pkg
Material: Polypropylene
Temperature: 0 - 121 ºC (autoclavable)

Paired Standard & Weighted Closures

The ultimate sample buoyancy and vertical orientation can be achieved by applying both a Standard and a Weighted Spectra/Por Closure to opposite ends of the same dialysis tubing. The Paired Closures are autoclavable.

Product Specifications

Functional Benefit: Buoyancy and vertical orientation
Membrane Types: Standard RC only
5 Sealing Widths: 12 mm, 23 mm, 35 mm, 55 mm, 75 mm
Paired colors: Orange/White
Qty: 10 standard & weighted pairs/pkg
Material: Polypropylene
Temperature: 0 - 121ºC (autoclavable)

Ordering Information: Spectra/Por® Closures (Standard, Weighted, Magnetic & Paired)

		Color	Closure Sealing Width 12 mm	23 mm	35 mm	55 mm	75 mm	Qty
Spectra/Por® Closures (only use with Standard Grade RC Tubing)	Standard Type	Orange	132734	132735	132736	132737	132738	10/pkg
		White	142734	142735	142736	142737	142738	
		Green	142834	142835	142836	142837	142838	
		Blue	142934	142935	142936	142937	142938	
	Weighted Type	White	132742	132743	132744	132745	132746	10/pkg
	Magnetic Type	Red	-	132760	132762	132764	132766	2/pkg
	Paired Standard & Weighted	Orange/White	132749	132750	132751	132752	132753	10 pairs/pkg

Dialysis Membrane Accessories

Spectra/Por® Dialysis Reservoirs

These polystyrene cylindrical reservoirs provide the optimum environment for laboratory dialysis. The included stir-bar creates a vortex that draws the dialysis tubing or Ready-to-Use Dialysis Device (RDD) into the center, maximizing dialysis efficiency.

Spectrum offers 2 volume sizes:

600 ml for RDD's up to 1 ml & tubing flat widths up to 16 mm
1,800 ml for any size RDD & tubing flat widths up to 80 mm

Part No.	Description	Volume	Height	Diameter
132002	Dialysis Reservoir, small	600 ml	12.5 cm	11.5 cm
132005	Dialysis Reservoir, large	1800 ml	30 cm	11.5 cm

Spectra/Por® Membrane Kit

The Spectra/Por Membrane Kit features Biotech Grade Regenerated Cellulose (RC) dialysis tubing in 3 different MWCO's and all the accessories required for a complete dialysis package. Instead of guessing the MWCO, the Membrane Kit is the perfect solution for dialysis applications where there are either a range of solute sizes or the solute size is unknown.

The Spectra/Por® Membrane Kit includes:

1.5 m of Biotech Grade RC Tubing (16 mm flat width) in 3 MWCO's:
- 0.5 m of 3.5 - 5 kD Biotech Tubing
- 0.5 m of 8 - 10 kD Biotech Tubing
- 0.5 m of 20 kD Biotech Tubing

7 Spectra/Por Closures:
- 3 Standard
- 3 Weighted
- 1 Magnetic-Weighted

1 Spectra/Por Dialysis Reservoir (1800 ml) with stir bar

Part No.	Description
132000	Spectra/Por Membrane Kit

Spectra/Por® Openers

Spectra/Por Openers have an adhesive inside surface that grips the dry tubing and allows you to easily pull the membrane sides apart for sample loading. Peel off adhesive cover, fold over the dry tubing so both vertical edges of the adhesive align with the center of tubing, firmly press together and then slowly pull the folds apart.

Part No.	Description	Qty
132730	Spectra/Por Openers	100/pkg

Heavy Metal Cleaning Solution

While rinsing Spectra/Por dialysis membrane in water is typically sufficient to remove glycerine or preservative, Spectrum offers Heavy Metal Cleaning Solution for the removal of the trace levels of heavy metals introduced during the manufacturing process of Spectra/Por 1, 2, 3, 4, 5 & 6. (Note that Spectra/Por 7 is already pre-cleaned.) Heavy Metal Cleaning Solution is recommended for ultra-sensitive dialysis applications like binding studies and equilibrium dialysis or when low levels of these contaminants may interfere with subsequent analyses of the dialysis samples.

Part No.	Description	Volume
132908	Heavy Metal Cleaning Solution	8 oz (236 ml)

Spectra/Gel® Absorbent

Ideal for concentrating protein and large molecular species in dialysis tubing and ready-to-use dialysis devices. Apply the dry polyacrylate-polyalcohol compound to the outside of any MWCO dialysis membrane to draw-out and bind water and efficiently reduce sample volume. Then simply wipe or rinse away the hydrated absorbent. Compound is too large to enter membrane.

Features & Benefits

Easy, safe & cost effective
Achieve 10-fold concentration in 1 hour with 100 g

Part No.	Description	Qty
292600	Spectra/Gel Absorbent	500 g

Glass Dialysis Weights

Glass Dialysis Weights can be inserted into any membrane type of tubing to help maintain vertical orientation during dialysis. The quantity of weights required depends on the tubing length, flat-width and amount of head-space. Glass Dialysis Weights are inert and non-binding. Average diameter for glass weights is 15 mm.

Part No.	Description	Qty
132740	Glass Dialysis Weights	50/pkg

Flat-Sheet Dialysis Systems

Since many dialysis applications do not conform to using conventional dialysis tubing, Spectrum offers 3 dialysis systems that utilize flat-sheet membranes to increase the efficiency of dialysis for more demanding applications: MacroDialyzers, MicroDialyzers and Equilibrium Dialyzers.

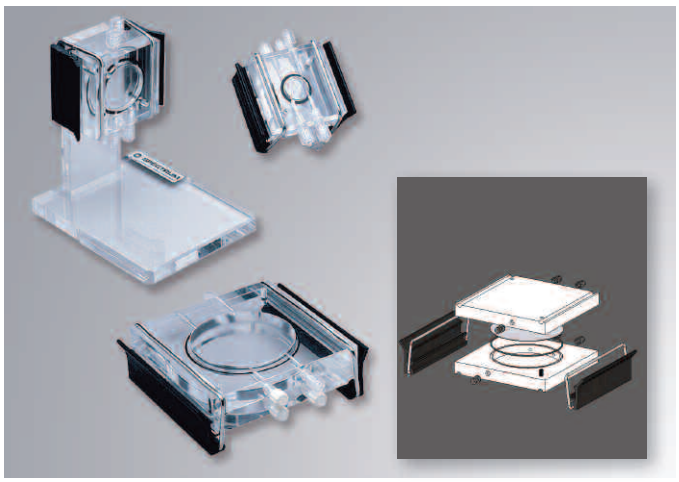
Applications:

- Binding Studies of proteins, drugs, dyes, metals & ligands
- Preparation of protein solutions for electrophoresis
- Buffer exchange for HPLC or chromatography fractions
- Adjusting electrolyte concentration & composition
- Desalting and/or pH change of macromolecular solutions
- Virus purification post sucrose gradient centrifugation

Spectra/Por® MacroDialyzer

Rapid Dialysis of 1 - 50 ml Samples

Designed for the continuous circulation of both the sample solution and the dialysate buffer, Spectra/Por MacroDialyzers increase the rate of dialysis by allowing significant flow agitation while maintaining a more effective concentration gradient. Available in 4 volume sizes (1 ml, 5 ml, 10 ml and 50 ml), MacroDialyzers consist of two half-cell chambers with a dialysis membrane disc clamped between to separate the sample solution from the dialysate. Each half-cell has 3 female Luer fitting ports, 1 for sample loading and 2 that allow for dynamic dialysis flow of at least 2 times the half-cell volume of sample and no limit on buffer volume. Both the sample and the buffer half-cell chambers can also be operated in static dialysis mode by capping off the flow ports and incorporating a magnetic stir bar.



Features & Benefits

Circulation of sample & dialysate provides rapid dialysis
Dialysis of up to 2x half-cell chamber volume and more
Static dialysis or continuous circulation operation
No limit on dialysate volume increases dialysis efficiency

Product Specifications

4 Half Cell Sizes:	1 ml, 5 ml, 10 ml, 50 ml
Cell Dimensions:	(refer to ordering information)
Membranes:	Standard RC Membrane Discs

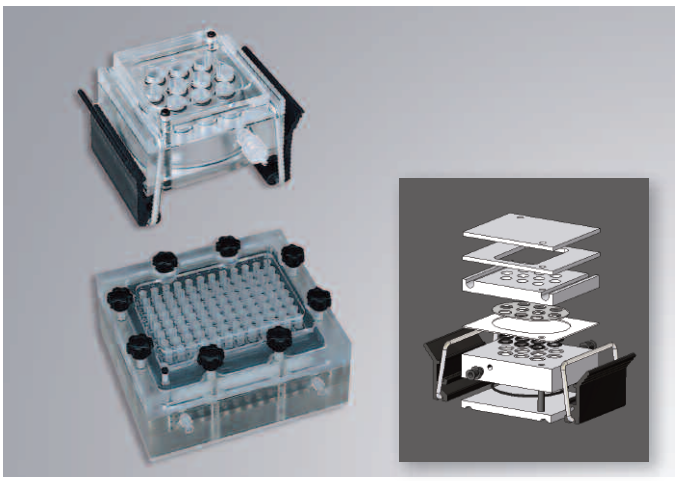
Components

2 Half-Cell Chambers:	Polished acrylic
Chamber O-ring:	Viton®
2 Locking Clamps:	Nylon & stainless steel
6 Fittings:	Polypropylene, threaded-female Luer-Lok™
6 Fitting Caps:	Polypropylene, male Luer-Lok™
6 Fitting O-rings:	Buna

Spectra/Por® MicroDialyzer

Rapid Dialysis of Micro-Volume Samples

The Spectra/Por MicroDialyzer is designed for the simultaneous dialysis of multiple micro-volume samples separated from a common dialysate chamber by a single membrane to provide uniform conditions for all samples. The dialysate chamber can either accommodate a magnetic stir bar for agitation in static mode or be connected via female Luer fittings for circulation of a larger buffer volume to maintain a more effective concentration gradient in dynamic dialysis. The MicroDialyzer multi-layer design consists of a dialysate chamber, flat-sheet membrane & multi-well sample plate clamped together (bolted for 96-well) with sample reservoir and cover plates to protect the samples. Available in 2 sample well configurations, 10 - 500 µl wells or 96 - 150 µl wells.



Features & Benefits

Simultaneous dialysis of multiple micro-volume samples
Common dialysis membrane & dialysate for uniform conditions
Static dialysis or continuous buffer circulation
No limit on buffer volume increases gradient efficiency

Product Specifications

2 well configurations:	10-500 µl or 96-150 µl
Dimensions:	(refer to ordering information)
Membranes:	RC Membrane Flat-sheets

Components

5 Assembly Plates:	Polished acrylic (bottom, chamber, sample well, reservoir & cover)
2 Guide Posts:	Delrin
Chamber O-ring:	Viton® (10 well only)
Chamber Gasket:	Buna-N (96 well only)
2 Locking Clamps:	Nylon & stainless steel (10 well only)
8 Locking Bolts:	Nylon head, SS threaded shaft (96-well only)
2 Fittings:	Polypropylene, threaded-female Luer-Lok™
2 Fitting caps:	Polypropylene, male Luer-Lok™
2 Fitting O-rings:	Buna

Ordering Information: Spectra/Por® MacroDialyzer & Spectra/Por® MicroDialyzer

		Part No.	Description	Half-Cell Volume Size	Cell Chamber Dia. x Depth (mm)	Membrane Disc Dia.
Spectra/Por® MacroDialyzer	Systems	132374	Spectra/Por MacroDialyzer	1.0 ml	20 x 10	33 mm
		132376		5.0 ml	38 x 10	47 mm
		132377		10 ml	38 x 20	47 mm
		132379		50 ml	80 x 20	100 mm
		Part No.	**Description**	**Half-Cell Volume Size**	**Contents & Qty**	
	Replacement Parts	132338	MacroDialyzer Replacement Kit	1.0 ml	6 luer sets, 3 3-way valves, 2 O-rings	
		132339		5.0 ml & 10 ml		
		132340		50 ml		

		Part No.	Description	Well Volume	Dimensions L x W x H (cm)	Chamber Volume
Spectra/Por® MicroDialyzer	Systems	132321	Spectra/Por 10-Well MicroDialyzer	500 µl	7.5 x 6.4 x 4.0	30 ml
		132326	Spectra/Por 96-Well MicroDialyzer	150 µl	15.2 x 13.3 x 5.0	112 ml
		Part No.	**Description**	**Well Volume**	**Contents & Qty**	
	Replacement Parts	132328	10-Well Sample Plate	500 µl	1 plate	
		132330	96-Well Sample Plate	150 µl		
		132334	Sample Well O-rings	500 µl	20 O-rings	

Related Products:

Standard RC Membrane Discs & Flat-Sheets
Robust dialysis membrane with broad range compatibility pg 18

Hollow Fiber Micro-Dialysis

Only Spectrum brings micro-dialysis to the laboratory by offering hollow fiber membranes for conducting micro-dialysis applications for critically small volumes. Made from Standard Regenerated Cellulose (RC) impregnated with glycerin, these hollow fiber membranes have a 0.2 mm ID. While tubular membranes have lower and less effective Q-factors (surface area to volume ratio), hollow fiber micro-dialysis membranes possess a Q-factor of 20 making them very efficient and ideal for working with samples less than 0.5 ml. Spectrum's 13 and 18 kD MWCO hollow fiber membranes are available as individual fibers for *in vivo* micro-dialysis or bundled for *in vitro* or rapid micro-dialysis.

Hollow Fiber Specifications

2 MWCO's:	13 and 18 kD
Fiber OD:	216 µm
Fiber ID:	200 µm
Working Volume:	5 µl/fiber
Surface Area / Length:	6.3 mm^2/cm
Volume / Length:	0.31 µl/cm
Q-Factor:	20

Spectra/Por® Micro-dialysis Hollow Fibers

in vivo Dialysis of Micro-liter Volumes

Implantation of individual micro-dialysis hollow fibers are ideal for the recovery or introduction of micro-quantity biologicals or pharmaceutical materials in a localized tissue environment. After injecting sample into the lumen with a syringe, simply dip the ends of the fiber in epoxy to seal, allow to dry and then implant. 20 individual RC hollow fibers cut in 15.24 cm (6 in.) lengths available in 13 kD and 18 kD MWCO's.

***in vivo* MicroDialysis Applications:**

- Introduction of pharmaceuticals for drug discovery
- Localized tissue toxicity studies
- Radio-isotope metabolite studies
- Mutagenicity experimentation
- Inter-cerebral dialysis of transmitters (catecholamines and neuropeptides)
- Micro-dialysis of intracellular adenosine

Features & Benefits

Biologically inert regenerated cellulose membrane
0.2 mm lumen ID for efficient dialysis of microliter volumes
Sealable with epoxy for implantation

Ordering Information

Part No.	Description	MWCO	Length	Qty
132294	*in vivo* Micro-dialysis Fibers	13 kD	15.24 cm	20/pkg
132295	*in vivo* Micro-dialysis Fibers	18 kD	15.24 cm	20/pkg

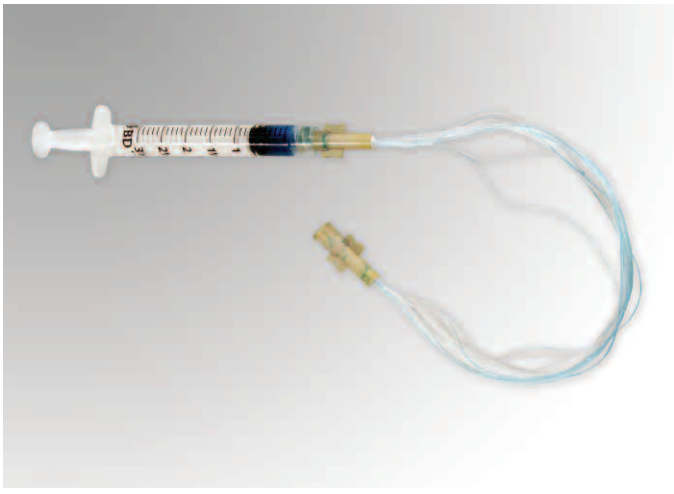
Spectra/Por® Micro-dialysis HF Bundles

Rapid or *in vitro* Dialysis of Small Volumes

Whether conducting a simple desalting or a complex *in vitro* study, hollow fiber micro-dialysis bundles are ideal for the rapid and efficient dialysis of small volume samples that are valuable and difficult to attain. Available in 13 kD and 18 kD, the hollow fiber bundles consist of 20 fibers with 0.2 mm ID potted together on both ends to a pair of female Luer-Lok™ ports. The hollow fiber bundle can be capped off with the sample encapsulated or connected for capillary circulation (3 ml/hr/fiber) and submerged in a standard buffer for lab dialysis or a simulated true-to-life environment for *in vitro* studies.

***in vitro* MicroDialysis Applications:**

- Micro-dialysis of metabolites for pharmacology
- Comparison to *in vivo* micro-dialysis studies
- Dialysis studies in an artificial capillary
- Preparation of micro-samples for gel electrophoresis or *in vivo* implantation



Features & Benefits

Biologically inert regenerated cellulose membrane
0.2 mm lumen ID for efficient dialysis of microliter volumes
Female Luer-Lok™ connection ports for sample circulation

Ordering Information

Part No.	Description	MWCO	No. of Fibers	Hold-up Vol.
132274	Hollow Fiber Bundle	13 kD	20	140 µl
132266	Hollow Fiber Bundle	18 kD	20	140 µl

Fundamentals of Dynamic Dialysis

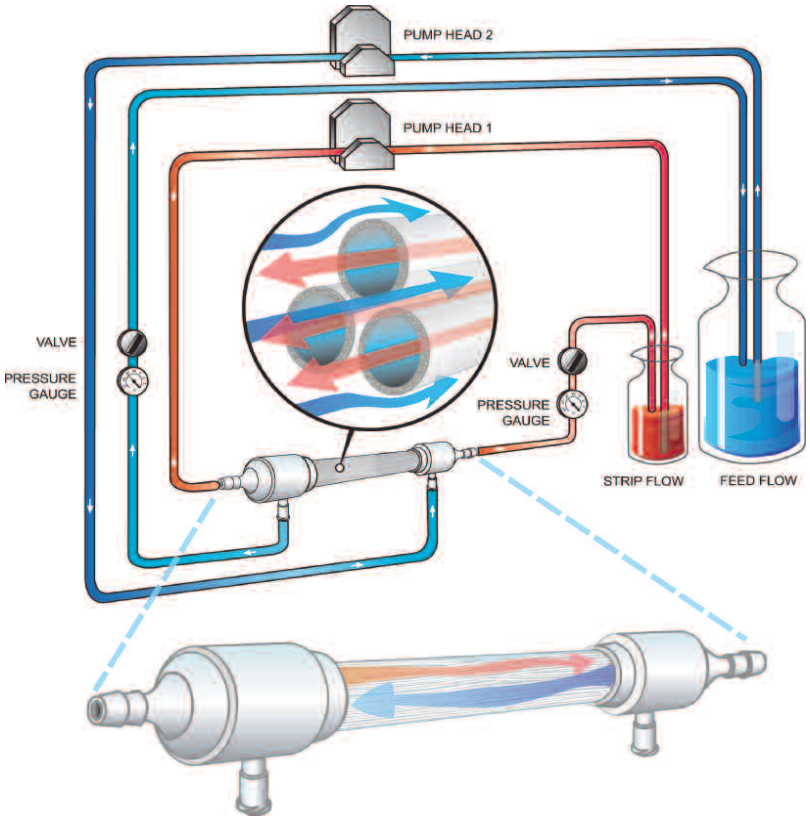
While standard static dialysis is very popular in the laboratory, Dynamic Dialysis uses flow dynamics to increase both the rate and efficiency of dialysis. Circulating the sample and/or the dialysate creates the highest possible concentration gradient to significantly decrease dialysis time. Other benefits of the sweeping action is that it prevents membrane fouling and in some situations generates a pressure differential. This supplemental driving force increases the hypo-osmotic mass transfer rate across the semi-permeable membrane and allows for sample concentration during the dialysis process. Depending on the application requirements, there are two basic sample conditions that can be utilized for different reasons or purposes in Dynamic Dialysis:

1. Streaming Dialysate & Static Sample

Increased rate of dialysis
Small volume sample
Delicate sample
Large volume dialysate

2. Streaming Dialysate & Streaming Sample (Counter-Current Dialysis)

Maximum rate of dialysis
Large volume sample
More durable sample
Large volume dialysate



ADVANTAGES OF DYNAMIC DIALYSIS

- Rapid and Efficient Dialysis
- Saves Valuable Time
- Dialysis of Larger Sample Volumes
- Flow Stream Prevents Membrane Fouling & Maintains Suspension of Solutes
- Eliminates Need for Dialysate Changes
- Open System: dialysate goes to drain
- Closed System: dialysate recirculated

Counter-Current Dialysis for Maximum Efficiency

Maximum "clearance" can be achieved by circulating the sample stream and the dialysate stream on different sides of the semi-permeable membrane in opposite (counter-current) directions to provide the largest concentration gradient. Clearance (C_s) is defined as the overall mass transfer rate of a solute per unit of time (ml/min) and is proportional to the feed flow rate of a solution (Q_f) and to the concentration difference across the membrane barrier ($C_{bi} - C_{bo}$) less the sweep solution concentration (C_{di}).

$$C_s = Q_f (C_{bi} - C_{bo}) / C_{bi} - C_{di}$$

(Note that C_{di} is essentially 0 in an open system with sweep flow to drain.)

Applications:

- Desalting or pH Change
- Plasma / Serum Concentration
- Protein Preparation
- Electrophoresis Gels
- Antibody Concentration
- Clarification and Purification
- Binding Studies
- Temperature Regulated Dialysis
- Open System & Batch Dialysis

3 MEMBRANE CONFIGURATIONS AVAILABLE FOR DYNAMIC DIALYSIS

Ready-to-Use Tubular Membrane Device:
Spectra/Por® Tube-A-Lyzer ..... pg 12

Flat Sheet Membrane Dialysis Systems:
Spectra/Por® MacroDialyzer & MicroDialyzer ..... pg 24

Hollow Fiber Membrane Device:
Spectra/Por® HF Dialysis Modules ..... pg 30

Spectra/Por® HF Dialysis Modules

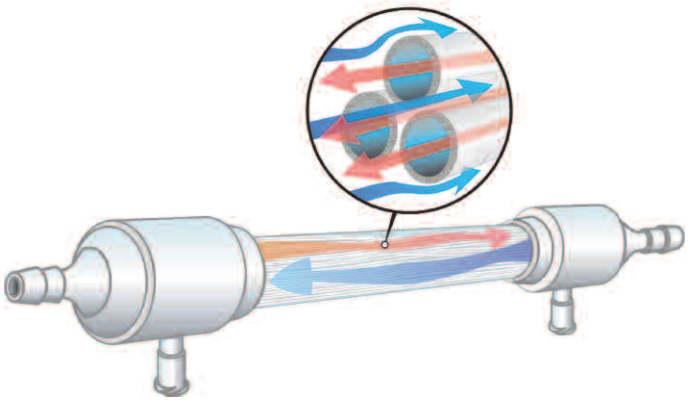
Highly Efficient Dialysis of Multi-liter Volumes!

Only Spectrum offers a highly efficient, counter-current dialysis device convenient and easy enough to operate in the laboratory. Based on the mechanics of a kidney, the Spectra/Por HF Dialysis Module is designed to provide more efficient performance than a conventional dialysis membrane used in a typical "static" dialysis set-up. The dialysis module consists of an open-ended bundle of hollow fiber membrane potted in a tubular housing to create two distinct flow chambers, lumen and extracapillary, each with inlet and outlet port access. The semi-permeable hollow fiber membrane that separates the two chambers selectively permits passage based on size and concentration gradient of solutes while restricting other solutes from passing between the 2 chambers. By operating the module in a counter-current flow mode, the solutes passing through the membrane are quickly swept away and diluted into a large volume of dialysate solution ("sweep"), maintaining the largest concentration gradient possible.

QUICK & EFFICIENT DIALYSIS!

- Complete Dialysis in Hours
- Dialysis of 100 ml to Multi-liter Samples
- Achieve Higher Purities
- Concentration of Delicate Macromolecules

Two Membrane Performance Types Available: HP & SP



Spectra/Por HF Dialysis Modules are available in two performance types: "High Performance" (HP) Membrane offers much higher flux rates to significantly reduce the total time for dialysis, while "Standard Performance" (SP) helps control the effects of osmotic pressure to reduce sample dilution and high turgor pressures in high salt conditions.

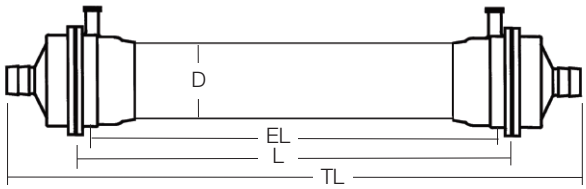
Major Design Features

1. **Hollow Fiber Membrane Geometry**
   Drastically larger surface area increases the rate of dialysis
2. **Inlet / Outlet "Flow-stream" Connection Ports**
   Dialysis of multi-liter volumes of sample & dialysate
   Dialysate to drain connection for single pass sweep
   Static encapsulation of delicate sample in extracapillary chamber
3. **Counter-current "Flow-stream" Design**
   Prevents membrane polarization & fouling
   Continuous mixing & suspension of sample & dialysate
   Maintains the largest concentration gradient possible
   Highest mass transfer rate significantly reduces dialysis time
4. **Two Membrane Performance Types**
   HP for increased membrane flux
   SP for better control of osmotic pressure effects

Product Specifications & Components

Housing:	Polysulfone (PS)
Inlet/Outlet Ports:	½" Hose Barb (HB)
Permeate Ports:	Female Luer-Lok™ (FLL)
Potting:	Polyurethane
2 Membrane Types:	HP Polysulfone & SP Polysulfone
2 MWCO's:	10 kD & 30 kD
Sample Volume:	100 ml – 10+ liters
Packaging:	Dry

Product Dimensions: 1 Module Size



D = diameter, TL = total length, L = fiber length, EL = effective fiber length

Flow-Path Size (FP)	D (mm)	TL (cm)	L (cm)	EL (cm)
1x FP	31.2	27.6	22.3	20.8

Ordering Information

Part No.	Membrane Performance Type	MWCO	HF Dimensions ID x OD	HF Surface Area ID x OD
500-016	HP Polysulfone	10 kD	200 x 280 µm	6500 x 9100 cm^2
500-017	SP Polysulfone	10 kD	200 x 280 µm	6500 x 9100 cm^2
600-085	HP Polysulfone	30 kD	200 x 320 µm	4870 x 7800 cm^2

Related Product:
KrosFlo® Research I Pump & Stand pg 67

Fundamentals of Laboratory Filtration

Filtration is a technology that utilizes a porous barrier to separate suspended or dissolved materials in solution based on size or molecular weight, eliminating the need for centrifugation, solvent phase changes or methods that may damage product. Application of a positive or negative pressure differential across the selective permeable filter drives the separation in a sieve-like manner. Smaller constituents pass through the membrane while the larger solutes are retained.

Spectrum offers a complete range of filtration solutions. Products are categorized by macrofiltration, microfiltration and ultrafiltration applications and techniques; as well as, Direct Flow Filtration and Tangential Flow Filtration.

Macrofiltration
Filtration of particles 5 µm or larger

Being the simplest and least expensive, macrofiltration is conventionally defined as the filtration of particles that are 5 µm or larger.

Spectrum offers a large assortment of Spectra/Mesh® screens in several polymer types with mesh opening sizes ranging from 5 µm to 1 mm. Spectra/Mesh screens are offered in various sizes that can be used with common laboratory funnels and glassware.

See Spectra/Mesh Products Starting on **Pg 38**

Microfiltration
Filtration of particles 0.05 µm to 0.5 µm

Microfiltration is the separation of particles like cells, bacteria, macrophages and cellular debris from a solution. Membranes used in microfiltration applications have 0.05-0.5 µm pore sizes. Spectrum offers Direct Flow Filter (DFF) and Tangential Flow Filter (TFF) filter modules in various membrane chemistries for microfiltration applications.

See DFF Products Starting on **Pg 33**
See TFF Products Starting on **Pg 40**

Ultrafiltration
Filtration of particles 1 kD to 1000 kD

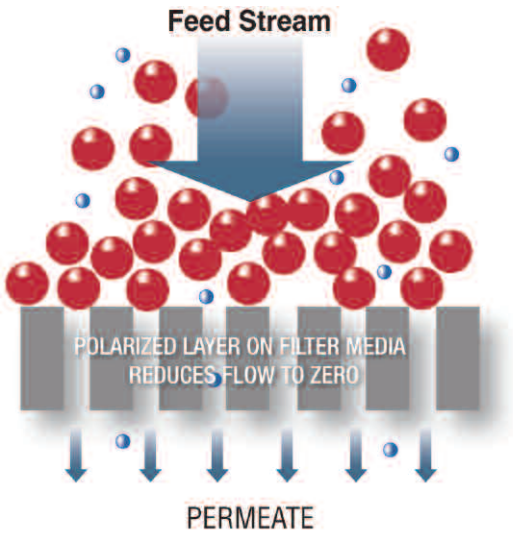
Ultrafiltration is used for the purification or concentration of small particles like proteins, viruses or nanoparticles. Ultrafiltration membranes are characterized based on a nominal molecular weight cut off (MWCO) that retains at 90%. Spectrum offers Tangential Flow Filtration filter modules in various membrane chemistries for ultrafiltration applications.

See Ultrafiltration Products Starting on **Pg 40**

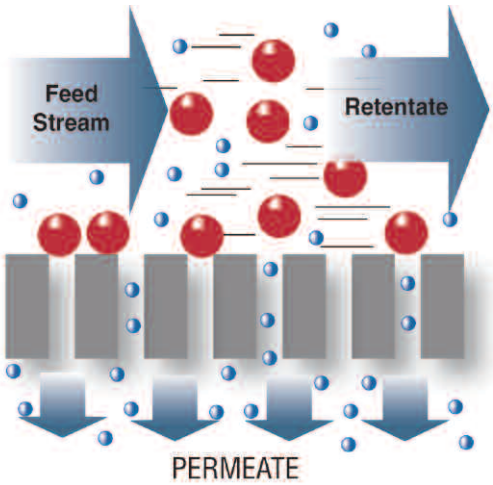
Direct Flow Filtration (DFF) vs. Tangential Flow Filtration (TFF)

Spectrum Labs provides two unique filtration methods, Direct Flow Filtration (DFF) and Tangential Flow Filtration (TFF) also known as cross flow filtration.

DFF is preferable for applications in which the filtrate is desired, such as bacterial and virus removal. TFF is preferable for applications in which fast permeate rates are desired and the retentate is desired, such as protein concentration and cell washing.



Direct Flow Filtration
(low permeate rate)



Tangential (Cross) Flow Filtration
(high permeate rate)

Microfiltration
Sterilizing Grade Direct Flow Filtration

Spectrum's Hollow Fiber (HF) Microfilters are ideal for cold sterilization, sample clarification or point-of-use filtration. They are designed with a 0.2 µm mixed cellulose ester DynaFibre® membrane looped in a small filter device to maximize surface area (SA) and flow rate while minimizing membrane plugging and protein-binding (< 2 µg/cm²). This efficiency is only possible with hollow fiber filter devices because filtration occurs from outside the porous fibers into the multiple lumen that pass the filtrate to a common outlet port. Spectrum also incorporates a hydrophobic vent fiber in the microfilters (except DynaGards) that readily passes air bubbles to avoid "air lock", a problem that commonly blocks flow in other filter devices. Spectrum offers 5 Hollow Fiber Microfiltration devices: MiniKap, MediaKap, MediaKap Plus, CultureGard and DynaGard.

MiniKap® Point-of-Use Hollow Fiber Filters
Efficient Laboratory Liquid & Gas Filtration

Excellent for water & gas filtration systems, MiniKap Hollow Fiber filters have the filtration efficiency of the DynaFibre® and air vent fiber in a device with a 1/4" MNPT, Luer-Lok™ or hose barb inlet/outlet connections.

Features:

- 0.2 µm DynaFibre® Hollow Fiber Membrane
- High Surface Area in Compact Device
- Includes an Automatic Vent to Prevent Air Lock
- High Flux Rate
- USP XXI Class VI Tested and Approved
- Non-Pyrogenic with LAL Testing
- 100% Integrity Tested

Product Specifications

Liquid Pore Rating:	0.2 µm
Gas Pore Rating:	0.01 µm (for low humidity gas only)
Membrane SA:	225 or 500 cm²
Inlet/Outlet Conn.:	¼" MNPT, variable hose barb, Luer-Lok™
Packaging:	6/pkg, irradiated or non-sterile

Components

HF Membrane:	Mixed cellulose ester
HF Vent:	Polypropylene
Potting Material:	Polyurethane
Housing:	Polycarbonate
End-caps:	Clear & pigmented polysulfone

Ordering Information: MiniKap®

		Part No.	Description	Pore Rating	Surface Area	Suggested Volume	IN / OUT Connections	IRR	Qty/Pkg
Direct Flow Filtration	MiniKap®	MK2M-201-V6S	MiniKap	0.2 µm	225 cm²	50 - 100 L	FLL / MLL	YES	6
		MK2M-204-V6N					1/4MNPT / 1/4MNPT	NO	
		MK2M-210-V6S					1/4MNPT / VarHB	YES	
		MK2M-212-V6S					VarHB / VarHB	YES	
		MK2M-512-V6S			500 cm²	100 - 200 L	VarHB / VarHB	YES	

FLL = Female Luer-Lok™, MLL = Male Luer-Lok™

MediaKap® & MediaKap® Plus HF Filters

Sterile Filtration of Culture Medium with Serum

MediaKap Filters with 0.2 µm Dynafibre membrane are designed to efficiently sterilize and clarify culture media or buffer solutions. MediaKap Plus Filters have an advanced DynaFibre® membrane that increases filtration efficiency and dramatically reduces the time required to filter serum-enriched medium. Both filters can be operated by gravity or under pressure by a peristaltic pump or pressure vessel. Sterile MediaKap and MediaKap Plus Filters are available in 5 different sizes that can filter 2 , 5, 10, 25 or 50 liter volumes in 15 – 20 minutes. Each is available with an optional filling bell that protects the sterile environment and reduces the risk of contamination.

Features

- 0.2 µm DynaFibre® Hollow Fiber Membrane
- Biocompatible
- High Surface Area in Compact Device
- Includes an Automatic Vent to Prevent Air Lock
- High Flux Rate
- USP XXI Class VI Tested and Approved
- Non-Pyrogenic with LAL Testing
- 100% Integrity Tested

Product Specifications

2 Filter Types:	MediaKap & MediaKap Plus
5 Volume Sizes:	2, 5, 10, 25 and 50 liter
Pore Rating:	0.2 µm
Membrane SA:	refer to Ordering Information below
Inlet/Outlet Conn.:	refer to Ordering Information below
Packaging:	Irradiated

Components

HF Membrane:	Mixed cellulose ester
HF Vent:	Polypropylene
Potting Material:	Polyurethane
Housing:	Polycarbonate
End-caps:	Clear & pigmented polysulfone
Filling Bell:	PVC (if present)

Performance Specifications

Filter Size & Type	Water Flow @ 10 psig	DMEM w/o serum	DMEM w/ serum
MediaKap-2	400 ml/min	0.2 – 2 L	-
MediaKap-5	750 ml/min	2 – 5 L	-
MediaKap-10	1000 ml/min	5 – 10 L	-
MediaKap-25	1400 ml/min	10 – 25 L	-
MediaKap-50	2000 ml/min	25 – 50 L	-
MediaKap-2 Plus	400 ml/min	5 L	0.2 – 2 L
MediaKap-5 Plus	750 ml/min	10 L	2 – 5 L
MediaKap-10 Plus	1000 ml/min	20 L	5 – 10 L
MediaKap-25 Plus	1400 ml/min	50 L	10 – 25 L
MediaKap-50 Plus	2000 ml/min	100 L	25 – 50 L

Ordering Information: MediaKap® & MediaKap® Plus

		Part No.	Description	Pore Rating	Surface Area	Suggested Volume	IN / OUT Connections	IRR	Filling Bell	Qty/Pkg
Direct Flow Filtration	MediaKap®	ME2M-02B-12S	MediaKap-2	0.2 µm	35 cm^2	0.2 - 2 L	FLL / Male Slip Luer	YES	YES	12
		ME2M-020-18S							NO	18
		ME2M-05B-12S	MediaKap-5		70 cm^2	2 - 5 L			YES	12
		ME2M-050-18S							NO	18
		ME2M-10B-12S	MediaKap-10		100 cm^2	5 - 10 L	1/4HB / 1/4HB		YES	12
		ME2M-100-18S							NO	18
		ME2M-25B-06S	MediaKap-25		185 cm^2	10 - 25 L	VarHB / VarHB		YES	6
		ME2M-50B-03S	MediaKap-50		440 cm^2	25 - 50 L			YES	3
	MediaKap® Plus	MP2M-02B-12S	MediaKap-2 Plus	0.2 µm	35 cm^2	0.2 - 2 L*	FLL / Male Slip Luer	YES	YES	12
		MP2M-020-18S							NO	18
		MP2M-05B-12S	MediaKap-5 Plus		70 cm^2	2 - 5 L*			YES	12
		MP2M-050-18S							NO	18
		MP2M-10B-12S	MediaKap-10 Plus		100 cm^2	5 - 10 L*	1/4HB / 1/4HB		YES	12
		MP2M-25B-06S	MediaKap-25 Plus		185 cm^2	10 - 25 L*	VarHB / VarHB		YES	6
		MP2M-50B-03S	MediaKap-50 Plus		440 cm^2	25 - 50 L*				3

*Volumes for serum-enriched media

FLL = Female Luer-Lok™

CultureGard® Perfusion Filters

Sterile Protection for Culture Feeding & Harvesting

CultureGard Hollow Fiber (HF) Filters are designed to reduce the risk of contamination to continuous perfusion cultures. The use of two filters in series allows the user to easily remove the first filter if it becomes plugged or contaminated while the second filter maintains the downstream sterile barrier for continued perfusion. Luer-Lok™ connectors provide a convenient retrofit to any hollow fiber or deep tank bioreactor system. All CultureGard units are manufactured with DynaFibre®, a 0.2 µm microporous, naturally hydrophilic filter membrane. The use of DynaFibre results in low extractable and excellent biocompatibility. The CultureGard also contains hydrophobic polypropylene vent fibers that prevents "air lock" by allowing air bubbles in stream to pass. Manufactured to the highest standards, CultureGard units are nonpyrogenic, non-cytotoxic, 100% integrity tested and pass USP XXI Class VI toxicity testing.

Features

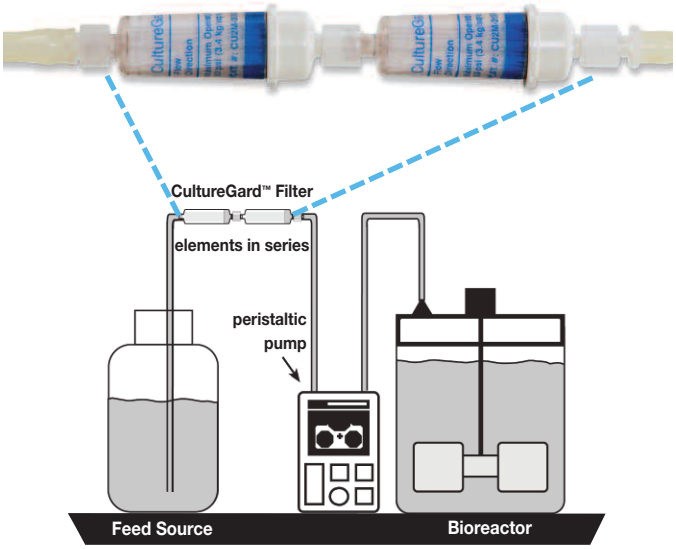
- 0.2 µm DynaFibre® Hollow Fiber Membrane
- Autoclavable
- Biocompatible
- High Surface Area in Compact Device
- Includes an Automatic Vent to Prevent Air Lock
- High Flux Rate
- USP XXI Class VI Tested and Approved
- Non-Pyrogenic with LAL Testing
- 100% Integrity Tested

Product Specifications

Pore Rating:	0.2 µm
Membrane SA:	70 cm^2
Inlet/Outlet Conn.:	FLL / MLL
Packaging:	12/pkg, non-sterile

Components

HF Membrane:	Mixed cellulose ester
HF Vent:	Polypropylene
Potting Material:	Polyurethane
Housing:	Clear polysulfone
End-caps:	Pigmented polysulfone
⅛" HB Adaptors:	Polypropylene (4 MLL & 4 FLL)



Ordering Information: CultureGard®

	Part No.	Description	Pore Rating	Surface Area	Suggested Volume	IN / OUT Connections	IRR	Filling Bell	Qty/Pkg
Perfusion Filters — CultureGard®	CU2M-205-12N	CultureGard	0.2 µm	70 cm^2	2 - 50 L	FLL / MLL	NO	NO	12

FLL = Female Luer-Lok™, MLL = Male Luer-Lok™

DynaGard® Hydrophilic Syringe Tip Filters

Mixed Cellulose (ME) Membrane for Aqueous Solutions

Uniquely designed with looped 0.2 µm DynaFibre® membrane, blue Dynagard filters provide a large surface area and high flux rate. The narrow housing design minimizes hold-up volume while enabling easy aspiration and dispensing in ampules, test tubes & other small vessels. Compared to flat sheet disk filters, DynaGards can filter highly viscous solutions more gently and efficiently.

Features

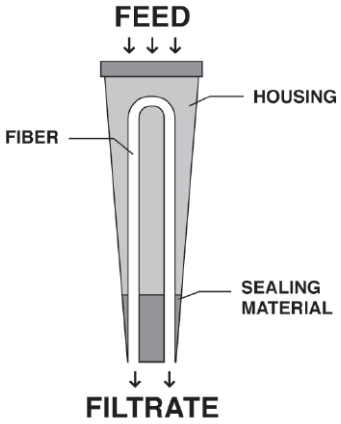
- 0.2 µm hydrophilic DynaFibre® Hollow Fiber Membrane
- Ultra Low Hold Up Volume
- Narrow Tip for Easy Access
- High Flux Rate
- USP XXI Class VI Tested and Approved
- Non-Pyrogenic with LAL Testing
- 100% Integrity Tested

Product Specifications: 3 Sizes Available

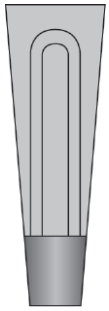
Membrane SA:	2.5 cm^2	3.4 cm^2	5.5 cm^2
Filtration Volume:	< 5 ml	1 – 10 ml	5 – 20 ml
Type 1 Hold-up Volume:	< 260 µl	< 375 µl	< 485 µl
Type 2 Hold-up Volume:	< 45 µl	< 80 µl	< 120 µl
Type 3 Hold-up Volume:	< 18 µl	< 23 µl	< 35 µl
Pore Rating:	0.2 µm	0.2 µm	0.2 µm
Housing Length:	3.0 cm	4.3 cm	5.4 cm
Housing Diameter:	0.6 cm	0.6 cm	0.6 cm
Top End:	FLL	FLL	FLL
Bottom End:	ML Slip	MLL	ML Slip
Available Irradiated:	YES	YES	YES

Components

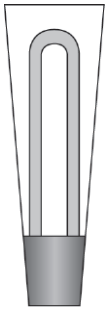
Housing: Polycarbonate (blue)
HF Membrane: Hydrophilic Mixed Cellulose Ester (ME)
Potting: Epoxy



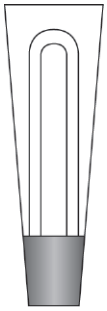
Type 1
Total hold-up volume



Type 2
Hold-up volume at bubble point



Type 3
Hold-up volume after air purge



Ordering Information: DynaGard® Blue - Mixed Cellulose Ester (ME) for Aqueous Solutions

		Part No.	Description	Pore Rating	Surface Area	Suggested Volume	IN / OUT Connections	IRR	Filling Bell	Qty/Pkg
Direct Flow Filtration	DynaGard® ME	DG2M-110-50S	DynaGard - ME	0.2 µm	2.5 cm^2	< 5 ml	FLL / ML Slip	YES	N/A	50
		DG2M-110-200						NO		200
		DG2M-23L-50S			3.4 cm^2	1 - 10 ml	FLL / ML	YES		50
		DG2M-23L-100						NO		100
		DG2M-330-50S			5.5 cm^2	5 - 20 ml	FLL / ML Slip	YES		50
		DG2M-330-100						NO		100

FLL = Female Luer-Lok™, ML = Male Luer-Lok™

DynaGard® Hydrophobic Syringe Tip Filters

Polypropylene (PP) Membrane for Organic Solutions

Specifically designed for filtering HPLC, solvent and organic samples, the white hydrophobic DynaGard Filters feature a polypropylene hollow fiber membrane incorporated in a highly efficient, sleek housing. DynaGard filters provide minimum hold-up volume and maximum sample recovery.

Polypropylene DynaGards are available in 0.2 µm membrane pore rating and 2 filter surface areas. The narrow design provides easy aspiration and injection of fluids into and out of vials, ampules, test tubes and other vessels with small openings.

Features

- High Chemical Resistance
- 0.2 µm Hydrophobic Polypropylene Membrane
- Ultra Low Hold Up Volume
- Narrow Tip for Easy Access
- High Flux Rate
- 100% Integrity Tested

Product Specifications: 2 Sizes Available

Membrane SA:	0.8 cm^2	3.9 cm^2
Filtration Volume:	< 5 ml	5 - 20 ml
Hold-up Volume (after air purge):	< 8 µl	< 30 µl
Pore Rating:	0.2 µm	0.2 µm
Housing Length:	3.0 cm	5.4 cm
Housing Diameter:	0.6 cm	0.6 cm
Top End:	FLL	FLL
Bottom End:	ML Slip	ML Slip
Available Irradiated:	NO	NO

Components

Housing:	Polypropylene (white)
HF Membrane:	Hydrophobic Polypropylene (PP)
Potting:	Epoxy

Ordering Information: DynaGard® White - Polypropylene (PP) for HPLC and Solvent Filtration Applications

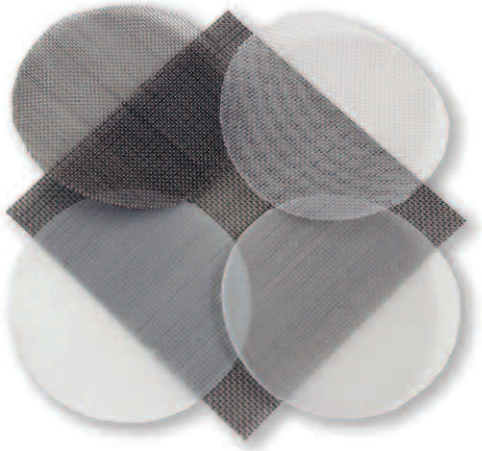
		Part No.	Description	Pore Rating	Surface Area	Suggested Volume	IN / OUT Connections	IRR	Qty/Pkg
Direct Flow Filtration	DynaGard® PP	DG2P-110-200	DynaGard - PP	0.2 µm	0.8 cm^2	< 5 ml	FLL / ML Slip	NO	200
		DG2P-320-100			3.9 cm^2	5 – 20 ml			100

FLL = Female Luer-Lok™, ML = Male Luer-Lok™

Macrofiltration

Macrofiltration is the separation of suspended materials visible to the naked eye by means of a size selective barrier with an opening ≥ 5 µm. There is a wide range of filter types available to meet the various macrofiltration applications with woven polymeric or stainless steel mesh being among the most popular.

Spectra/Mesh® Woven Filters



Spectrum provides a broad range of monofilament woven mesh screens, characterized by precise mesh openings, percent open area and mesh thickness.

Mesh Opening is the distance between the strands and is expressed in microns.

Open Area represents the proportion of total area that is open space and is expressed as a percentage.

Mesh Thickness is the thickness of the woven screen (approximately two strands) and is expressed in microns.

U.S. Standard Sieve Size Reference Table

The U.S. Bureau of Standard and American Society of Testing Materials adopted the following "Sieve Size" specification as a means to standardize filtration mesh screens. The sieve number is an arbitrary designation and does not refer to a mesh count/inch.

Mesh Size	Mesh Opening (µm)	Mesh Size	Mesh Opening (µm)
5	4000	45	354
6	3360	50	297
7	2830	60	250
8	2380	70	210
10	2000	80	177
12	1680	100	149
14	1410	120	125
16	1190	140	105
18	1000	170	88
20	841	200	74
25	707	230	63
30	545	270	53
35	500	325	44
40	420	400	37

Spectra/Mesh® Application Selection Guide

There are five polymer types to select from depending on the macrofiltration application: Nylon (N), Polyester (P), Polypropylene (PP), PEEK (PK) and Stainless Steel (SS).

Macrofiltration Application	Spectra/Mesh® Type N	P	PP	PK	SS
ENVIRONMENTAL					
Hazardous Waste	✓			✓	
Drinking Water Purification	✓	✓	✓	✓	
Acid Rain Measurement	✓			✓	✓
Suspended Soils	✓	✓	✓	✓	✓
Rock Grading			✓		✓
Air / Asbestos	✓	✓			✓
Coal Dust Analysis	✓	✓			✓
Oceanography	✓				✓
Trace Element Analysis	✓	✓	✓	✓	
Fertilizers	✓	✓	✓	✓	✓
PHARMACEUTICAL					
Aqueous Serum Clarification	✓	✓	✓		
Organic Serum Clarification		✓	✓	✓	
Immunological & Diagnostic Assays	✓	✓	✓		
Solution Manufacturing	✓	✓	✓	✓	✓
CHEMICAL					
Bacteria Removal	✓	✓	✓	✓	✓
Particulate Removal	✓	✓	✓	✓	✓
Solvent Filtration	✓	✓	✓		
Gas Filtration			✓	✓	✓
Fuel Testing			✓	✓	✓
RESEARCH					
Cellular Separations	✓	✓	✓	✓	
Tissue Culture	✓	✓	✓	✓	
Colony Transfer	✓	✓			
Plaque Lifts	✓	✓	✓	✓	
Immunology	✓	✓			
HPLC Sample Preparation	✓	✓			
Cellular & Bacterial Analysis		✓			
Protein & Virus Purification	✓	✓		✓	
Trace Element Analysis		✓		✓	
RNA & DNA Hybridization	✓		✓		
Electron Microscopy	✓	✓	✓	✓	✓
INDUSTRY					
Photoresist / Semi-conductor	✓		✓		
Electronic Fluid Filtration	✓		✓	✓	✓
Air Venting		✓	✓		✓
Tank Venting		✓	✓	✓	✓
Steam Sterilization				✓	✓
Business Machines & Appliances	✓	✓			✓
Automotive Equipment	✓	✓			✓
Pulp & Paper Production	✓	✓	✓	✓	✓
Food Processing	✓	✓			
Cosmetic Processing	✓	✓	✓		
Wine & Beer Clarification/Sterilization	✓				

Product Specifications & Properties

Material Type	Nylon	Polyester	Polypropylene	PEEK	Stainless Steel
Mesh Openings:	5 - 1000 µm	5 - 300 µm	105 - 1000 µm	35 - 800 µm	30 - 914 µm
Water Affinity:	hydrophilic	mildly hydrophobic	hydrophobic	very hydrophobic	hydrophilic
Strength/Durability:	high	high	high (wet)	medium	very high
Adsorption:	high	low	low (inert)	very low (inert)	high
Best Resistance:	corrosives	alkalis / organics	acids / alkalis / organics	nearly all	corrosives
pH Resistance:	pH 3 - 10	pH 3 - 13	pH 2 - 14	pH 1 - 14	pH 4 - 12
Thermal Stability:	up to 180°C	up to 140°C	up to 130°C	up to 250°C	up to 180°C
Sterilization:	irradiation	autoclavable	autoclavable	autoclavable	autoclavable / irradiation

Ordering Information: Spectra/Mesh® Woven Filters

		Mesh			Disc Diameter					Sheet
		Opening (µm)	Open Area (%)	Thickness (µm)	25 mm	47 mm	55 mm	90 mm	150 mm	30 x 30 cm
Spectra/Mesh® Woven Filters	Nylon	5	2	100	148100	148130	145816	145925	145580	146519
		8	1	75	148101	148131	145815	145924	145581	146518
		10	2	45	148102	148132	145813	145922	145582	146514
		20	14	55	148104	148134	145811	145920	145583	146510
		25	16	55	148105	148135	145810	145919	145576	146508
		30	21	64	148106	148136	145809	145918	145584	146506
		41	33	60	148108	148138	145807	145916	145585	146502
		46	37	65	148109	148139	145806	145915	145572	146500
		53	36	60	148110	148140	145805	145914	145586	146498
		60	45	55	148111	148141	145803	145912	145587	146494
		70	36	70	148113	148143	145801	145910	145588	146490
		100	47	78	148115	148145	145799	145908	145589	146488
		200	55	125	148116	148146	145798	145907	145566	146487
		300	50	200	148117	148147	145797	145906	145564	146486
		600	51	445	-	-	-	-	-	146483
		710	45	350	-	-	-	-	-	146482
		1000	58	1350	-	-	-	-	-	146479
	Polyester	5	2	65	148240	148270	145828	145937	148315	146521
		10	2	55	148242	148272	145831	145939	145591	146524
		15	8	55	148243	148273	145832	145948	148316	146525
		21	15	70	148244	148274	145833	145940	145592	146526
		37	25	65	148247	148277	145836	145952	148318	146529
		43	29	70	148248	148278	145837	145942	145594	146530
		60	29	87	148250	148280	145840	145954	148319	146533
		74	36	90	148252	148282	145842	145956	148320	146535
		80	39	90	148253	148283	145843	145945	145597	146536
		300	44	258	148257	148287	148300	145962	148323	148390
	Polypropylene	105	26	212	148496	148516	145775	145884	145608	146436
		149	34	193	148498	148518	145773	145882	145609	146432
		210	34	308	148500	148520	145771	145880	145610	146428
		250	31	430	148501	148521	145770	145879	148538	146426
		297	36	420	148502	148522	145769	145878	145611	146424
		350	34	525	148503	148523	145767	145876	145612	146422
		500	39	610	148505	148525	145765	145874	145613	146418
		840	46	725	148508	148528	145762	145871	148541	146412
		1000	45	1020	148509	148529	145761	145870	145615	146410
	PEEK	35	22	71	148800	148801	148802	148803	148804	146802
		115 x 145	56	50	148840	148841	148842	148843	148844	146804
		220	56	128	148860	148861	148862	148863	148864	146806
		300	36	370	148880	148881	148882	148883	148884	146808
		800	45	750	148940	148941	148942	148943	148944	146814
				Qty/Pkg:	10	10	10	10	5	3
	Stainless Steel	30	30	50	-	-	145827	145936	-	148985
		51	42	56	-	-	145826	145935	-	148986
		104	45.2	102	-	-	145825	145934	-	146439
		213	49.8	178	-	-	145823	145932	-	146438
		500	57	330	-	-	145817	145926	-	148987
		914	52	712	-	-	148931	148934	-	148989
				Qty/Pkg:			5	5		2

Tangential Flow Filtration (TFF)

Two of the most common methods for concentrating, purifying and clarifying biological materials or other particulate solutions are filtration and centrifugation. Centrifugation requires several hours for serial spinning, decanting and pellet re-suspension that typically results in damaged product, poor yields and only moderate purity. The most common type of filtration used in the laboratory setting is direct flow filtration that can also take many hours due to membrane plugging. Tangential flow filtration is the answer for faster separation. In less than an hour, hollow fiber TFF filter modules can concentrate, purify and/or clarify while providing higher purities and recoveries.

MicroKros® Hollow Fiber Filter Modules

for Micro and Ultra Tangential Flow Filtration

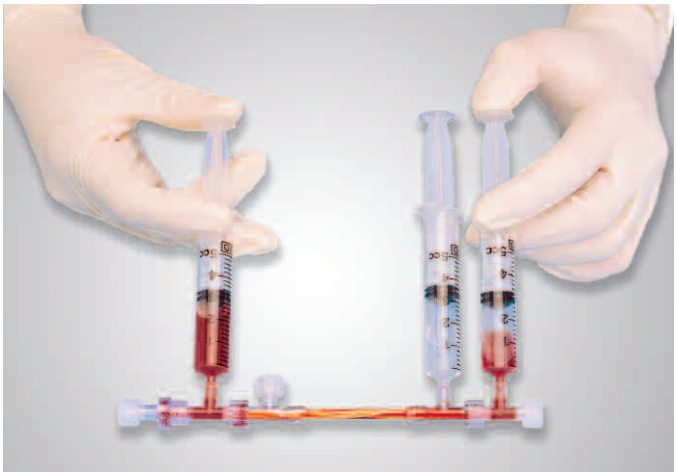
Designed for gentle tangential flow filtration of small volumes ranging from 1 – 100 ml, Single-Use MicroKros Hollow Fiber Filter Modules are the first efficient and practical tangential flow filtration devices for R&D scale volumes. While a peristaltic pump typically is used with MicroKros filters, these devices also offer the unique advantage of manual operation for quick and convenient separations of small volumes. Concentration utilizes two retentate syringes connected to the luer inlet/outlet ports to pass the sample back and forth through the membrane lumen while a third syringe collects the filtrate through one of the side-ports. A fourth syringe can be used to either supply more sample for concentration or buffer for diafiltration.

QUICK & EFFICIENT FILTRATION

- 5 - 30 minute Separations
- 2 modes: Pump Operation & Manual Operation
- Gentle Processing
- 90 – 99% Product Purity
- 85 – 95% Product Recovery

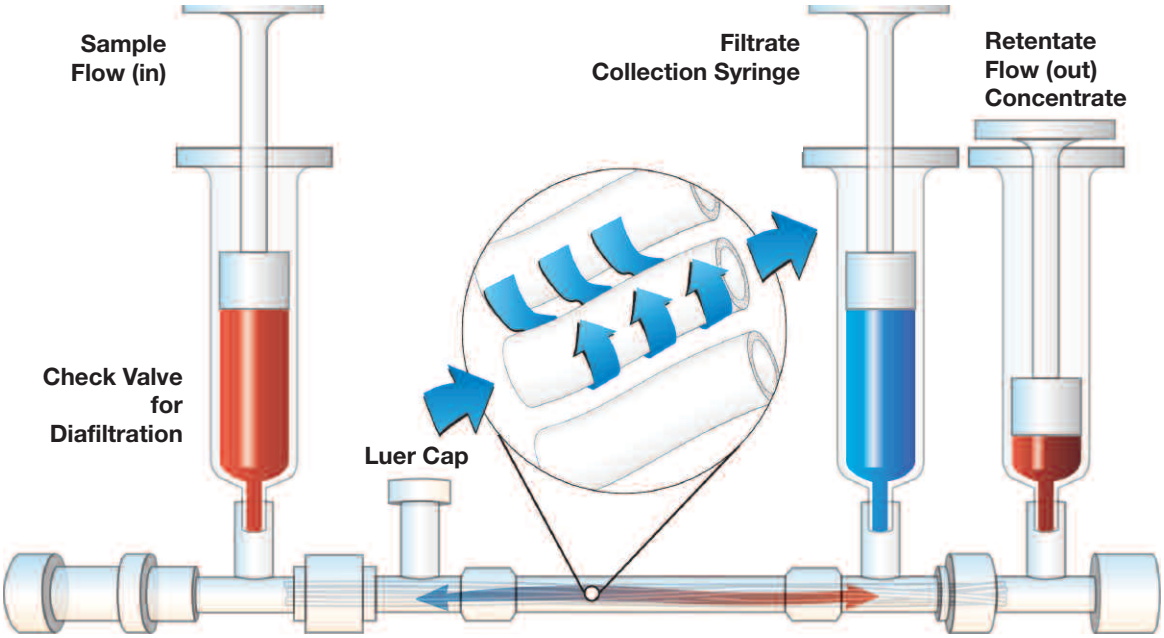
LABORATORY APPLICATIONS

- Cell Concentration
- Cell Diafiltration
- Virus Purification
- Virus Diafiltration
- Virus Clarification
- Lysate Clarification
- Bacteria Concentration
- Bacteria Diafiltration
- Protein Purification
- Protein Concentration
- Protein Diafiltration
- Micro-particle Diafiltration
- Nanoparticle Diafiltration
- Nucleic Acid Concentration



Concentration

Diafiltration

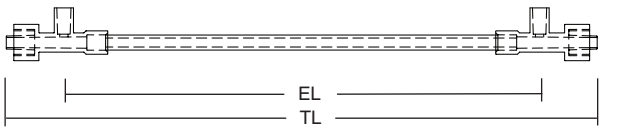


Product Specifications & Components

Housing:	Polysulfone
Inlet/Outlet Ports:	Male Luer-Lok™ (MLL)
Permeate Ports:	Female Luer-Lok™ (FLL)
Potting:	Epoxy
Process Volume:	1 – 100 ml
Surface Area (SA):	13 – 28 cm^2
Effective Length:	20 cm
Packaging:	Dry, pre-wetted or sterile

Product Dimensions

1 x FL



FL*	Surface Area (cm^2)	D (mm)	TL (cm)	EL (cm)
1 x FL	13 – 28	3.5	23	20

D = diameter, TL= total filter module length, EL = effective fiber length

*Used for HF module scale-up, FL is relative EL with 1FL MicroKros being the standard.

See pages 42 and 43 for complete Ordering Information

Related Product:
KrosFlo® Research I Pump & Stand pg 67

Ordering Information: MicroKros® Accessories Kit

	Part Number	Description	Components	Qty/Kit
Accessories Kit	ACPX-400-01N	MicroKros Accessories Kit	5 ml syringes	10
			Male Luer Cap	15
			Male Luer x 3⁄16" Hose Barb Fitting	10
			Check Valve	5
			Female Luer T connector	10

Ordering Information: MicroKros® Hollow Fiber Filter Modules

	Membrane		Hollow Fiber		Packaging		Part No.
	Pore Rating	Type	ID	Surface Area	Qty	Condition	
MicroKros® Hollow Fiber Modules	3 kD	NEW! mPES	0.5 mm	20 cm^2	1	Dry	C02-E003-05-N
					1	Sterile	C02-E003-05-S
	10 kD	NEW! mPES	0.5 mm	20 cm^2	1	Dry	C02-E010-05-N
					1	Sterile	C02-E010-05-S
		PS	0.5 mm	28 cm^2	1	Dry	C02-S010-05-N
					1	Wet	C02-S010-05-P
					1	Sterile	C02-S010-05-S
	30 kD	NEW! mPES	0.5 mm	20 cm^2	1	Dry	C02-E030-05-N
					1	Sterile	C02-E030-05-S
	50 kD	NEW! mPES	0.5 mm	20 cm^2	1	Dry	C02-E050-05-N
					1	Sterile	C02-E050-05-S
		PS	0.5 mm	28 cm^2	1	Dry	C02-S050-05-N
					1	Wet	C02-S050-05-P
					1	Sterile	C02-S050-05-S

For the availability of additional pore sizes, please contact Spectrum Labs Customer Service (see page 2 for all contact info).

Ordering Information: MicroKros® Hollow Fiber Filter Modules

	Membrane		Hollow Fiber		Packaging		Part No.
	Pore Rating	Type	ID	Surface Area	Qty	Condition	
MicroKros® Hollow Fiber Modules	70 kD	NEW! mPES	0.5 mm	20 cm²	1	Dry	C02-E070-05-N
					1	Sterile	C02-E070-05-S
	100 kD	NEW! mPES	0.5 mm	20 cm²	1	Dry	C02-E100-05-N
					1	Sterile	C02-E100-05-S
	500 kD	NEW! mPES	0.5 mm	20 cm²	1	Dry	C02-E500-05-N
					1	Sterile	C02-E500-05-S
		PS	0.5 mm	28 cm²	1	Dry	C02-S500-05-N
					1	Wet	C02-S500-05-P
					1	Sterile	C02-S500-05-S
	0.05 µm	PS	0.5 mm	28 cm²	1	Dry	C02-S05U-05-N
					1	Wet	C02-S05U-05-P
					1	Sterile	C02-S05U-05-S
	0.1 µm	ME	0.63 mm	20 cm²	1	Dry	C02-M10U-06-N
					1	Sterile	C02-M10U-06-S
	0.2 µm	ME	0.63 mm	20 cm²	1	Dry	C02-M20U-06-N
					1	Sterile	C02-M20U-06-S
			1.0 mm	13 cm²	1	Dry	C02-M20U-10-N
					1	Sterile	C02-M20U-10-S
		PES	0.5 mm	28 cm²	1	Dry	C02-P20U-05-N
					1	Sterile	C02-P20U-05-S
			1.0 mm	13 cm²	1	Dry	C02-P20U-10-N
					1	Sterile	C02-P20U-10-S
	0.5 µm	PES	0.5 mm	28 cm²	1	Dry	C02-P50U-05-N
					1	Sterile	C02-P50U-05-S
			1.0 mm	13 cm²	1	Dry	C02-P50U-10-N
					1	Sterile	C02-P50U-10-S

For the availability of additional pore sizes, please contact Spectrum Labs Customer Service (see page 2 for all contact info).

KrosFlo® Research IIi TFF System

A fully *integrated* Tangential Flow Filtration System for processing R&D volumes

NEW! The completely redesigned KrosFlo Research II*i* Tangential Flow Filtration (TFF) System is the ideal system for R&D scale microfiltration or ultrafiltration. The system consists of the KrosFlo Research II*i* Pump and Pump Head, now with an integrated KrosFlo Digital Pressure Monitor, KF Comm Data Collection Software, Disposable flow-path kit and Fittings kit, all of which have features that ensure efficient and reproducible Tangential Flow Filtration processing.

- Fully *integrated*
- Compact and Easy-to-Use
- Faster Processing Time
- Controls and Records Process Parameters
- Controls Transmembrane Pressure
- Maximum Product Recovery
- Makes Scale-up from R&D to Production Easy

Media Filtration

Spectrum's Hollow Fiber (HF) microfilters are ideal for cold sterilization, sample clarification and media filtration. They are designed with a 0.2 µm mixed cellulose ester DynaFibre® membrane looped in a small filter device to maximize surface area (SA) and flow rate while minimizing membrane plugging and protein-binding (< 2 µg/cm²). This efficiency is only possible with hollow fiber filter devices because filtration occurs from outside the porous fibers into the multiple lumen that pass the filtrate to a common outlet port. Spectrum also incorporates a hydrophobic vent fiber in the microfilters (except DynaGards) that readily passes air bubbles to avoid "air lock", a problem that commonly blocks flow in other filter devices. Spectrum offers 4 Hollow Fiber media filtration devices: MediaKap, MediaKap Plus, CultureGard and DynaGard.

MediaKap® & MediaKap® Plus HF Filters

Sterile Filtration of Culture Medium with Serum

MediaKap Filters with 0.2 µm Dynafibre membrane are designed to efficiently sterilize and clarify culture media or buffer solutions. MediaKap Plus Filters have an advanced DynaFibre® membrane that increases filtration efficiency and dramatically reduces the time required to filter serum-enriched medium. Both filters can be operated by gravity or under pressure by a peristaltic pump or pressure vessel. Sterile MediaKap and MediaKap Plus Filters are available in 5 different sizes that can filter 2 , 5, 10, 25 or 50 liter volumes in 15 – 20 minutes. Each is available with an optional filling bell that protects the sterile environment and reduces the risk of contamination.

Product Specifications

2 Filter Types:	MediaKap & MediaKap Plus
5 Volume Sizes:	2, 5, 10, 25 and 50 liter
Pore Rating:	0.2 µm
Membrane SA:	refer to Ordering Information below
Inlet/Outlet Conn.:	refer to Ordering Information below
Packaging:	Irradiated

Components

HF Membrane:	Mixed cellulose ester
HF Vent:	Polypropylene
Potting Material:	Polyurethane
Housing:	Polycarbonate
End-caps:	Clear & pigmented polysulfone
Filling Bell:	PVC (if present)

Performance Specifications

Filter Size & Type	Water Flow @ 10 psig	DMEM w/o serum	DMEM w/ serum
MediaKap-2	400 ml/min	0.2 – 2 L	-
MediaKap-5	750 ml/min	2 – 5 L	-
MediaKap-10	1000 ml/min	5 – 10 L	-
MediaKap-25	1400 ml/min	10 – 25 L	-
MediaKap-50	2000 ml/min	25 – 50 L	-
MediaKap-2 Plus	400 ml/min	5 L	0.2 – 2 L
MediaKap-5 Plus	750 ml/min	10 L	2 – 5 L
MediaKap-10 Plus	1000 ml/min	20 L	5 – 10 L
MediaKap-25 Plus	1400 ml/min	50 L	10 – 25 L
MediaKap-50 Plus	1400 ml/min	100 L	25 – 50

Ordering Information: MediaKap® & MediaKap® Plus

		Part No.	Description	Pore Rating	Surface Area	Suggested Volume	IN / OUT Connections	IRR	Filling Bell	Qty/Pkg
Media Filtration	MediaKap®	ME2M-02B-12S	MediaKap-2	0.2 µm	35 cm²	0.2 - 2 L	FLL / Male Slip Luer	YES	YES	12
		ME2M-020-18S							NO	18
		ME2M-05B-12S	MediaKap-5		70 cm²	2 - 5 L			YES	12
		ME2M-050-18S							NO	18
		ME2M-10B-12S	MediaKap-10		100 cm²	5 - 10 L	1/4HB / 1/4HB		YES	12
		ME2M-100-18S							NO	18
		ME2M-25B-06S	MediaKap-25		185 cm²	10 - 25 L	VarHB / VarHB		YES	6
		ME2M-50B-03S	MediaKap-50		440 cm²	25 - 50 L			YES	3
	MediaKap® Plus	MP2M-02B-12S	MediaKap-2 Plus	0.2 µm	35 cm²	0.2 - 2 L*	FLL / Male Slip Luer	YES	YES	12
		MP2M-020-18S							NO	18
		MP2M-05B-12S	MediaKap-5 Plus		70 cm²	2 - 5 L*			YES	12
		MP2M-050-18S							NO	18
		MP2M-10B-12S	MediaKap-10 Plus		100 cm²	5 - 10 L*	1/4HB / 1/4HB		YES	12
		MP2M-25B-06S	MediaKap-25 Plus		185 cm²	10 - 25 L*	VarHB / VarHB		YES	6
		MP2M-50B-03S	MediaKap-50 Plus		440 cm²	25 - 50 L*				3

FLL = Female Luer-Lok™ *Volumes for serum-enriched media

CultureGard® Perfusion Filters

Sterile Protection for Culture Feeding & Harvesting

CultureGard Hollow Fiber (HF) Filters are designed to reduce the risk of contamination to continuous perfusion cultures. The use of two filters in series allows the user to easily remove the first filter if it becomes plugged or contaminated while the second filter maintains the downstream sterile barrier for continued perfusion. Luer-Lok™ connectors provide a convenient retrofit to any hollow fiber or deep tank bioreactor system. All CultureGard units are manufactured with DynaFibre®, a 0.2 µm microporous hydrophilic filter membrane. DynaFibre hollow fiber membrane has low extractables and excellent biocompatibility. The CultureGard also contains hydrophobic polypropylene vent fibers that prevents "air lock" by allowing air bubbles in stream to pass. Manufactured to the highest standards, CultureGard units are nonpyrogenic, non-cytotoxic, 100% integrity tested and pass USP XXI Class VI toxicity testing.

Features

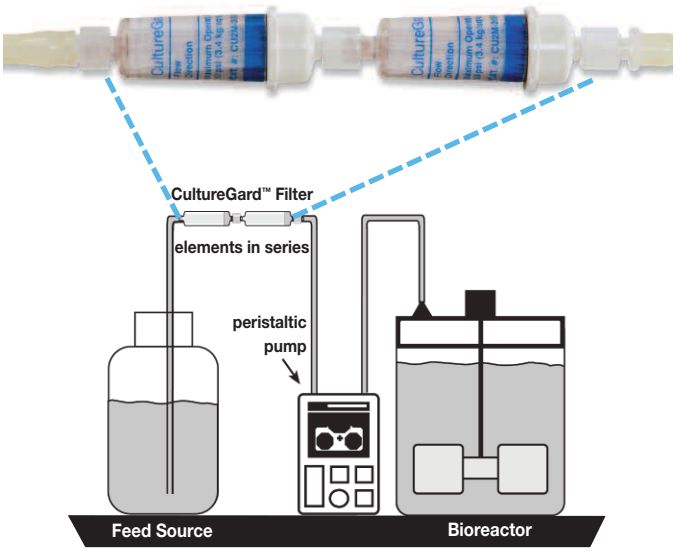
- 0.2 µm DynaFibre® Hollow Fiber Membrane
- Autoclavable
- Biocompatible
- High Surface Area in Compact Device
- Includes an Automatic Vent to Prevent Air Lock
- High Flux Rate
- USP XXI Class VI Tested and Approved
- Non-Pyrogenic with LAL Testing
- 100% Integrity Tested

Product Specifications

Pore Rating:	0.2 µm
Membrane SA:	70 cm^2
Inlet/Outlet Conn.:	FLL / MLL
Packaging:	12/pkg, non-sterile

Components

HF Membrane:	Mixed cellulose ester
HF Vent:	Polypropylene
Potting Material:	Polyurethane
Housing:	Clear polysulfone
End-caps:	Pigmented polysulfone
⅛" HB Adaptors:	Polypropylene (4 MLL & 4 FLL)



Ordering Information: CultureGard®

	Part No.	Description	Pore Rating	Surface Area	Suggested Volume	IN / OUT Connections	IRR	Filling Bell	Qty/Pkg
Media Filtration / CultureGard®	CU2M-205-12N	CultureGard	0.2 µm	70 cm^2	2 - 50 L	FLL / MLL	NO	NO	12

FLL = Female Luer-Lok™, MLL = Male Luer-Lok™

DynaGard® Hydrophilic Syringe Tip Filters

Mixed Cellulose (ME) Membrane for Aqueous Solutions

Uniquely designed with looped 0.2 µm DynaFibre® membrane, blue Dynagard filters provide a large surface area and high flux rate. The narrow housing design minimizes hold-up volume while enabling easy aspiration and dispensing in ampules, test tubes & other small vessels. Compared to flat sheet disk filters, DynaGards can filter highly viscous solutions more gently and efficiently.

Features

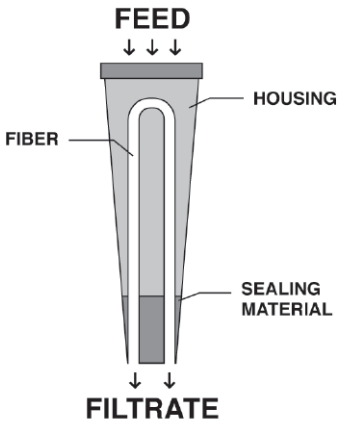
- 0.2 µm hydrophilic DynaFibre® Hollow Fiber Membrane
- Ultra Low Hold Up Volume
- Narrow Tip for Easy Access
- High Flux Rate
- USP XXI Class VI Tested and Approved
- Non-Pyrogenic with LAL Testing
- 100% Integrity Tested

Product Specifications: 3 Sizes Available

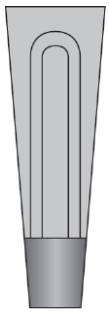
Membrane SA:	2.5 cm^2	3.4 cm^2	5.5 cm^2
Filtration Volume:	< 5 ml	1 – 10 ml	5 – 20 ml
Type 1 Hold-up Volume:	< 260 µl	< 375 µl	< 485 µl
Type 2 Hold-up Volume:	< 45 µl	< 80 µl	< 120 µl
Type 3 Hold-up Volume:	< 18 µl	< 23 µl	< 35 µl
Pore Rating:	0.2 µm	0.2 µm	0.2 µm
Housing Length:	3.0 cm	4.3 cm	5.4 cm
Housing Diameter:	0.6 cm	0.6 cm	0.6 cm
Top End:	FLL	FLL	FLL
Bottom End:	ML Slip	MLL	ML Slip
Available Irradiated:	YES	YES	YES

Components

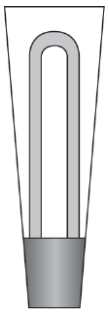
Housing: Polycarbonate (blue)
HF Membrane: Hydrophilic Mixed Cellulose Ester (ME)
Potting: Epoxy



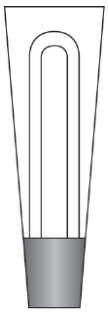
Type 1
Total hold-up volume



Type 2
Hold-up volume at bubble point



Type 3
Hold-up volume after air purge



Ordering Information: DynaGard® Blue - Mixed Cellulose Ester (ME) for Aqueous Solutions

		Part No.	Description	Pore Rating	Surface Area	Suggested Volume	IN / OUT Connections	IRR	Filling Bell	Qty/Pkg
Media Filtration	DynaGard® ME	DG2M-110-50S	DynaGard - ME	0.2 µm	2.5 cm^2	< 5 ml	FLL / ML Slip	YES	N/A	50
		DG2M-110-200						NO		200
		DG2M-23L-50S			3.4 cm^2	1 - 10 ml	FLL / MLL	YES		50
		DG2M-23L-100						NO		100
		DG2M-330-50S			5.5 cm^2	5 - 20 ml	FLL / ML Slip	YES		50
		DG2M-330-100						NO		100

FLL = Female Luer-Lok™, ML = Male Luer-Lok™

DynaGard® Hydrophobic Syringe Tip Filters

Polypropylene (PP) Membrane for Organic Solutions

Specifically designed for filtering HPLC, solvent and organic samples, the white hydrophobic DynaGard Filters feature a polypropylene hollow fiber membrane incorporated in a highly efficient, sleek housing. DynaGard filters provide minimum hold-up volume and maximum sample recovery.

Polypropylene DynaGards are available in 0.2 µm membrane pore rating and 2 filter surface areas. The narrow design provides easy aspiration and injection of fluids into and out of vials, ampules, test tubes and other vessels with small openings.

Features

- High Chemical Resistance
- 0.2 µm Hydrophobic Polypropylene Membrane
- Ultra Low Hold Up Volume
- Narrow Tip for Easy Access
- High Flux Rate
- 100% Integrity Tested

Product Specifications: 2 Sizes Available

Membrane SA:	0.8 cm^2	3.9 cm^2
Filtration Volume:	< 5 ml	5 - 20 ml
Hold-up Volume (after air purge):	< 8 µl	< 30 µl
Pore Rating:	0.2 µm	0.2 µm
Housing Length:	3.0 cm	5.4 cm
Housing Diameter:	0.6 cm	0.6 cm
Top End:	FLL	FLL
Bottom End:	ML Slip	ML Slip
Available Irradiated:	NO	NO

Components

Housing:	Polypropylene (white)
HF Membrane:	Hydrophobic Polypropylene
Potting:	Epoxy

Ordering Information: DynaGard® White - Polypropylene (PP) for HPLC and Solvent Filtration Applications

		Part No.	Description	Pore Rating	Surface Area	Suggested Volume	IN / OUT Connections	IRR	Qty/Pkg
Media Filtration	DynaGard® PP	DG2P-110-200	DynaGard - PP	0.2 µm	0.8 cm^2	< 5 ml	FLL / ML Slip	NO	200
		DG2P-320-100			3.9 cm^2	5 – 20 ml			100

FLL = Female Luer-Lok™, ML = Male Luer-Lok™

Fundamentals of Cell Encapsulation / Implantation with Hollow Fiber Membrane

Spectrum provides new technology developed by the National Cancer Institute for screening of anti-cancer compounds. Many researchers now routinely use this *in vivo* method of identifying compounds with potential therapeutic activity against cancer and HIV. The technology allows human cells to be implanted into host animals and subsequently retrieved in mass. While in the host, cells can be exposed to potential therapeutic compounds like antiviral agents and then retrieved from the animal to measure the impact of exposure to the compound. With this technology, target cells are macro-encapsulated in biocompatible hollow fibers. These macro-encapsulated cells are then implanted in the subcutaneous or intraperitoneal cavity of laboratory mice. This methodology is a significant step forward and results in significant savings of time, labor, amount of compound required, and the number of animals used in the evaluation of the potential therapeutic activity of candidate compounds. The hollow fiber assay is a unique *in vivo* model permitting the simultaneous evaluation of compound efficacy against six cell lines at subcutaneous and peritoneal sites (Hollingshead et al. Life Sci. 57; 131, 1995). This model was used to investigate the relationship between cell density and compound activity. Additionally, the model was adapted for mechanism of action studies. This technology is now used routinely by the National Cancer Institute of the NIH for testing compounds for anti-cancer activity. It is also being employed to look for antiviral compounds for HIV. Many different cancer cell lines, including some poorly tumorigenic lines, have been grown in KrosFlo Implant Membrane hollow fibers.

Spectrum's proprietary KrosFlo hollow fiber implant membranes provide a novel method for drug screening and cancer research. Perfectly suited for implantation, the modified Polyvinylidene Difluoride (mPVDF) hollow fiber membrane is biocompatible, hydrophobic and resistant to a wide variety of organic solvents, including most aqueous acids and bases. These hollow fibers can also be heat sealed and autoclaved without affecting the Molecular Weight Cut-Off (500,000 Dalton MWCO).

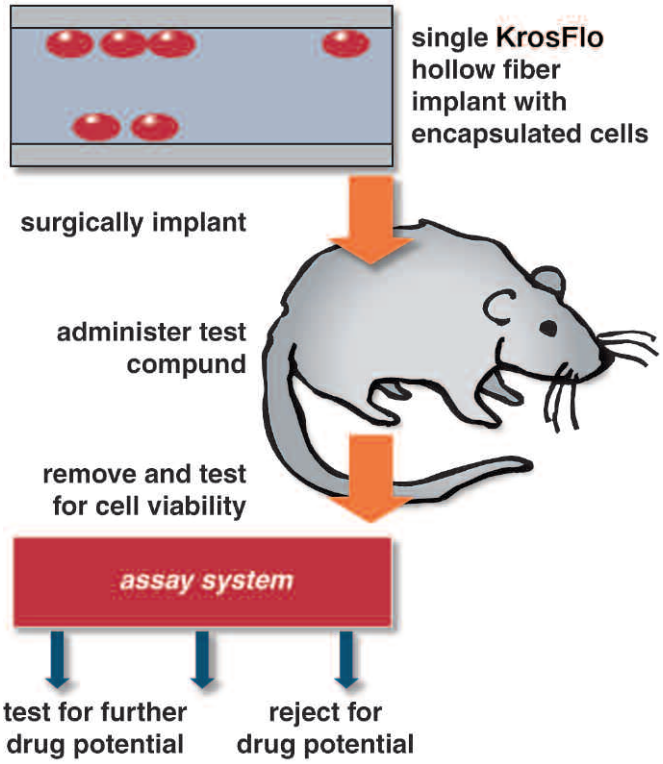
The surface of the KrosFlo Implant Membranes has demonstrated biocompatibility in various animal models. Multiple cell lines have been grown both *in vitro* and *in vivo* within the KrosFlo Implant Membranes. Cell lines grown within KrosFlo Implant Membranes, which have been implanted into a host animal, are not subject to immunological attack by the host animal. KrosFlo Implant Membranes containing cancer cell lines have been implanted into mice and used to screen for compounds having anti-cancer activity. Similarly, KrosFlo Implant Membranes containing HIV infected cell lines have been implanted into mice and used to screen for compounds having anti-HIV activity. Literature describing the implantation of KrosFlo Implant Membrane in animal models is available at www.spectrumlabs.com.

Tumor Type	Cell Line						
Lung	A549/ATCC	NCI-H23	NCI-H226	NCI-H460	NCI-H522		
Colon	Colo-205	HCC-2998	HCT-15	HCT-116	HT29	SW-620	
Lymphoid	CCRF-CEM	CEM-SS (HIV screen)	HL-60 (TB)	K-562	MOLT-4	RL	U937 (HIV screen)
Prostate	DU-145	JCA-1	PC-3	PC-3 (M)			
Breast	MCF-7	MDA-MB-231	MDA-N	MDA-MB-435			
Melanoma	LOX IM VI	SK-MEL-5	SK-MEL-28	UACC-62	UACC-257		
CNS	SF-295	SNB-75	U251				
Ovarian	IGROV1	OVCAR-3	OVCAR-5	SK-OV-3			
Renal	A498	CaKi-1	RXF-393	SN12C			

KROSFLO® Implant Hollow Fiber Membrane

For Drug Discovery and Development

Made from modified Polyvinylidene difluoride (PVDF), KrosFlo® Implant Membranes represent a revolutionary advance in separation technology. The membranes are biocompatible, hydrophobic and resistant to a wide variety of organic solvents as well as most aqueous acids and bases. The membranes can be heat sealed and autoclaved without affecting the molecular weight cut off (MWCO).



Encapsulated cells can be:

- Established cancer cell lines
- Virus infected cells
- Hematopoietic cells
- Bacteria
- Fungi

KROSFLO Implant Membranes isolate:

- Immune systems cells
- Viruses
- Mycoplasma

KROSFLO Implant Membranes have:

- Biocompatible inner and outer surface

Advantages over current xenographic model:

- 10 day assay versus 60 day assay
- Smaller assay variability, fewer animals needed
- Uses lesser amounts of test compounds
- Multiple cell lines can be tested simultaneously in same animal
- Compatible with different cell lines

Specifications:

Packaging:	Wet in DI water and autoclaved or Dry and not autoclaved
Material:	PVDF
Inner Diameter:	1.0 mm
Outer Diameter:	1.2 mm
Length:	34 cm/fiber
Quantity:	3 fibers/pkg

Ordering Information: KROSFLO® Implant Membranes

		Part No.	Material	MWCO	Storage	Pre-Autoclaved	Color	Length	Qty/Pkg
KROSFLO®	Implant Membranes	M138615	PVDF	500 kD	DI water	YES	White	34 cm/fiber	3 fibers/pkg
		M138616					Blue		
		M138617					Yellow		
		M138618					Green		
		S9320101			Dry	NO	White		
		S9320102					Blue		
		S9320103					Green		
		S9320104					Yellow		

TransferTube® Sampling Pipette

The disposable TransferTube is an innovative device for transferring liquid or coring solid samples with one hand. The large aperture is particularly useful for working with powders, suspensions, gels, creams, pastes and viscous fluids. Disposability reduces the risk of cross contamination associated with re-used pipettes and cutting instruments.

Applications

- Life Science: suspensions, mixtures & viscous solutions
- Microbiology: colony transfers
- Ecology/Environment: soil, mud, sludge & slurry coring
- Cosmetics: creams, gels, waxes & powders
- Food & Beverages: batters, pastes & sauces

Specifications

Material:	Polypropylene
Shaft & Plunger:	153 mm length x 6 mm diameter
Finger Ring:	16.5 mm x 20 mm (ID x OD)
Total Length:	175 mm
Capacity:	4 ml

Ordering Information: TransferTube®

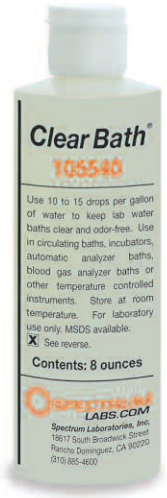
		Part No.	Description	Size	Qty/Pkg
Cell Culture	Accessories & Consumables	190195P	TransferTube Sampling Pipette	Standard Pack	250
		190195		Economy Pack	1000

Clear Bath® Water Treatment Solution

Keep water baths clean with Spectrum's Clear Bath. Only 12 drops per gallon (3 drops per liter) are necessary to keep water clean. One 2 oz (60 ml) bottle is sufficient for the treatment of 1500 to 1900 liters of water. One 8 oz (230 ml) bottles treats 6,000 to 10,000 liters of water. (Not recommended for use with soap or anionic wetting agents.)

For use with:

- Circulating water baths
- Incubators
- Temperature controlled instruments
- Humidifiers
- Automatic analyzer baths
- Blood/gas analyzers



Bessman Tissue Pulverizer

The stainless steel Bessman Tissue Pulverizer consists of a 2 component mortar with handles and a pestle, specifically designed for pulverizing 10 – 1000 mg of tissue. After chilling the Pulverizer in liquid nitrogen, the included 28 cm lead hammer is used on the mortar to completely homogenize the inserted sample. The sample can then easily be transferred without touching or thawing by removing the mortar and inverting the pestle assembly over a test tube. The small and medium Pulverizers each include 10 test tubes and the large Pulverizer includes one culture jar.

Specifications:	Small	Medium	Large
Sample Capacity:	10-50 mg	25-250 mg	100-1000 mg
Mortar Diameter:	6.6 mm	12.7 mm	25.6 mm
Mortar Height:	26.8 mm	47.3 mm	47.6 mm

Ordering Information: Clear Bath® & Tissue Pulverizer

		Part No.	Description	Size	Qty/Pkg
Cell Culture	Accessories & Consumables	105535	Clear Bath Water Treatment	Small (2 oz / 60 ml)	1
		105540		Large (8 oz / 237 ml)	
		189476	Bessman Tissue Pulverizer	Large	
		189475		Medium	
		189470		Small	

NEW! mPES Hollow Fiber Filter Modules

Single-Use Filter Modules for Tangential Flow Filtration

Spectrum Labs introduces new modified polyethersulfone hollow fiber filters, a major advancement in filtration.

Benefits:

- High flux rates for ***faster*** processing times
- Low protein binding for higher product yields
- Available in a wide range of pore sizes
- **Scalable** from R&D to Production
- **Priced for Single-Use**

NEW

scan to go to website

KrosFlo®

NEW! Drawer/Ganizer® Portable Organizer Trays

Spectrum introduces new Drawer/Ganizer Portable Trays molded from thicker 1/8 inch heavy duty polystyrene with easy-gripping folded edges for transporting assorted lab items and mobilizing experimental activities. The deeper compartments are better suited than most other lab trays for holding larger quantities as well as serving as secondary containment for spills. Like the original Drawer/Ganizer Spacers, these Portable Organizer Trays are designed for standard lab drawers, refrigerators and bench tops to organize and protect supplies, conserve valuable space and promote lab safety. Spectrum offers 6 configurations in two sizes (1 tray/pkg).

Pipette / Column Tray

Two sizes for sorting 4 or 6 types of pipettes, chromatography columns or long instruments in a protected parallel position.

Stopper / Fittings Tray

Great for separating large quantities of different types of small items. 2 sizes available with 12 or 16 equal compartments.

Parts / Chromatography Tray

Various size compartments for easy to find storage of lab & chromatography supplies like utensils, valves, connectors, etc.

Micropipettor Tray

2 sizes designed for storing up to 7 micropipettors, pipettes and/or glass syringes as well as 2 types of pipette tips.

Clamp / Instrument Tray

Two spacer sizes available, each with 3 compartment sizes for storing clamps, hardware, instruments and other odd-shaped items.

Utility / Equipment Tray

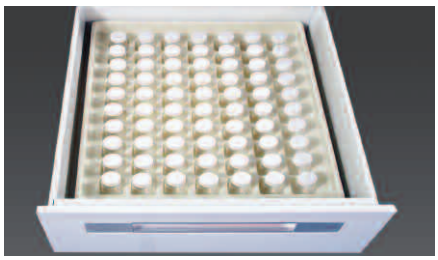
Ideal for the separation of bulky and/or fragile items that can otherwise be damaged. 2 sizes available, each with 4 spaces.

Drawer/Ganizer® Drawer Spacers

Spectrum's original Drawer/Ganizer Spacers are designed specifically to fit in standard lab drawers to organize lab supplies and save space. The custom compartments also help to maintain visual inventory and protect stored items. The 3 most popular configurations displayed below. Go to www.spectrumlabs.com/labware/DrawerGanizers to view the 8 other Drawer Spacer configurations available.

Grid / Vial Spacer

Secures upright vials or fragile items in 1" deep spaces. Large spacer has 9 rows of 11 spaces and small size has 7 rows of 10.



Beaker / Fleaker Spacer

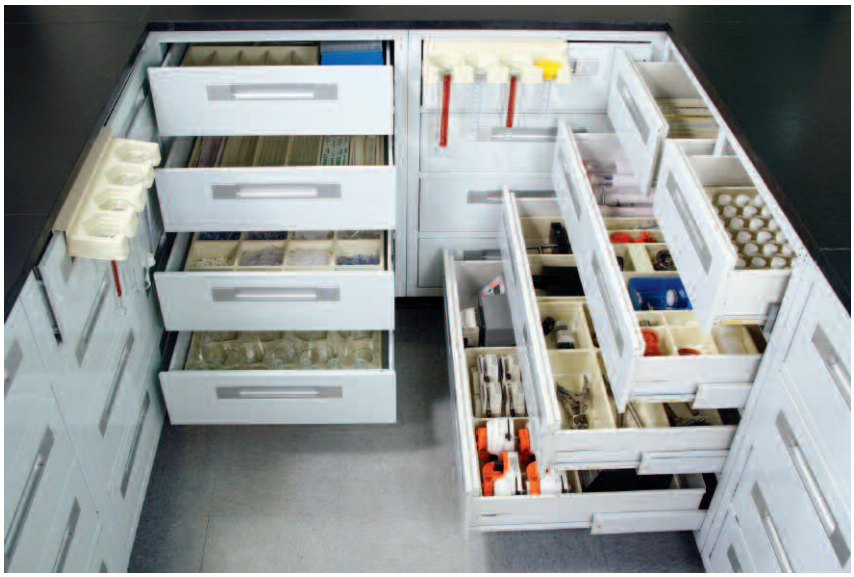
Round depressions with spout cut-outs for secure storage of 50 – 600 ml beakers. Great protection for drying glassware.

Tools Spacer

2 sizes available to help maintain a visual inventory of tools like hammers, screwdrivers, wrenches, pliers, tape measure, etc.

Drawer/Ganizer® Benefits

- Designed for Portability or Storage
- Stronger & More Durable
- Organize & Protect Lab Supplies
- Maintain Laboratory Inventory
- Maximize Working Space
- Increase Lab Safety
- Provides Secondary Containment



Related Products:
Refrig/Arranger® Storage Trays pg 64

Ordering Information: Organizer Trays & Drawer Spacers

		Part No.	Description	Size	Dimensions (cm)	No. of Comp.	Compartment Dimensions (cm)	Qty
Drawer/Ganizer®	Portable Organizer Trays	155510	Pipette / Colum Tray	Large	49 x 44 x 5	6	42 x 7	1/pkg
		155585		Small	34 x 44 x 5	4		
		155495	Stopper / Fittings Tray	Large	49 x 44 x 7	16	11 x 10	
		155570		Small	34 x 44 x 7	12	10 x 10	
		155450	Parts / Chromatography Tray	Large	49 x 44 x 7	15	various	
		155645		Small	34 x 44 x 7	7		
		155430	Micropipettor Tray	Large	49 x 44 x 7	7, 2	27 x 6, 23 x 23	
		155675		Small	34 x 44 x 7	5, 2	27 x 6, 16 x 14	
		155525	Clamp / Instrument Tray	Large	49 x 44 x 7	7	various	
		155600		Small	34 x 44 x 7	5		
		155465	Utility / Equipment Tray	Large	49 x 44 x 7	4	23 x 20	
		155630		Small	34 x 44 x 7	4	20 x 15	
	Drawer Spacers	144420	Grid / Vial Spacer	Large	49 x 44 x 6	99	3.2 x 3.2	2/pkg
		144665		Small	34 x 44 x 6	70		
		144480	Beaker / Fleaker Spacer	Large	49 x 44 x 5	27	5.7, 7.6 & 9.5 (diameter)	
		144555		Small	34 x 44 x 5	20		
		144435	Tools Spacer	Large	49 x 44 x 5	15	"suitcase spaces"	
		144660		Small	34 x 44 x 5	15		

(More Drawers Spacer configurations available at www.spectrumlabs.com/labware/DrawerGanizers)

Refrig/Arranger® Storage Trays

Refrig/Arranger Storage Trays are the ideal way to conserve valuable space in laboratory refrigerators and freezers and can also be used on laboratory bench tops and in cabinets. Made of lightweight, high-impact polystyrene, these sturdy trays are perfect for the safe transportation and refrigerated storage of glass vials and small bottles. The trays are also well-suited for storage of solutions, samples and tissues in freezers as low as -90°C.

Refrig/Arranger Storage Trays are available in either channel or grid configurations. Select from among 3 different channel widths (1.9 cm, 3.2 cm and 4.8 cm) or 2 grid sizes (1.9 x 1.9 cm and 3.2 x 3.2 cm). The Channel Trays feature a raised front edge that prevents breaks and permits labeling.

Refrig/Arranger® Benefits

- Convenient & Organized Storage System
- Channel or Grid Configurations
- Efficient Use of Valuable Space
- Protects Glass & Plastic Containers
- Transport from Bench-top to Fridge
- Secondary Containment for Spills
- Freezer Storage as low as to -90°C

Ordering Information: Storage Trays

		Part No.	Description	Size	Dimensions (cm)	No. of Compartments	Compartment Dimensions (cm)	Qty
Refrig/Arranger®	Storage Trays	183552	Channel Storage Tray	Large	34.3 x 40	7	4.8 (wide)	1/pkg
		183550		Medium		10	3.2 (wide)	
		183547		Small		13	1.3 (wide)	
		183554	Grid Storage Tray	Large		60	3.2 x 3.2	
		183556		Small		104	1.9 x 1.9	

Related Products:

Drawer/Ganizer® Organizer Trays & Drawer Spacers pg 62

Excellent for organizing or secondary containment in refrigerators and freezers

Coming Soon!

Fleaker® Glass Containers

Due to popular demand the Original Fleaker® will be re-introduced in 2012

- Combines the best of an Erlenmeyer flask and a Griffin beaker.
- Narrow recessed neck prevents splashing during vigorous stirring
- Makes handling, transporting and pouring easy
- Constructed of borosilicate glass
- Graduated for accurate measurements
- 3 volume sizes: 250 ml, 500 ml & 1000 ml

Contact customerservice@spectrumlabs.com to be notified when the new Fleaker® is available.
For more information go to www.spectrumlabs.com/labware/Fleaker.html

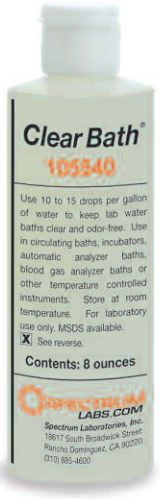
Disposables & Consumables

Clear Bath® Water Treatment Solution

Keep water baths clean with Spectrum's Clear Bath. Only 12 drops per gallon (3 drops per liter) are necessary to keep water clean. One 2 oz (60 ml) bottle is sufficient for the treatment of 1500 to 1900 liters of water. One 8 oz. (230 ml) bottles treats 6,000 to 10,000 liters of water. (Not recommended for use with soap or anionic wetting agents.)

For use with:

- Circulating water baths
- Incubators
- Temperature controlled instruments
- Humidifiers
- Automatic analyzer baths
- Blood/gas analyzers



Ordering Information: Clear Bath

	Part No.	Description	Size	Qty
Clear Bath®	105535	Clear Bath Water Treatment	Small (2 oz / 60 ml)	1/pkg
	105540		Large (8 oz / 237 ml)	

TransferTube® Sampling Pipette

The disposable TransferTube is an innovative device for transferring liquid and coring solid samples with one hand. The large aperture is particularly useful for working with powders, suspensions, gels, creams, pastes and viscous fluids. Disposable transferring reduces the risk of cross contamination associated with re-used pipettes and cutting instruments.

Applications

- Life Science: suspensions, mixtures & viscous solutions
- Microbiology: colony transfers
- Ecology/Environment: soil, mud, sludge & slurry coring
- Cosmetics: creams, gels, waxes & powders
- Food & Beverages: batters, pastes & sauces

Specifications

Material:	Polypropylene
Shaft & Plunger:	153 mm length x 6 mm diameter
Finger Ring:	16.5 mm x 20 mm (ID x OD)
Total Length:	175 mm
Capacity:	4 ml

Disposable Desiccant Plates

Spectrum's Disposable Desiccant Plates efficiently bind atmospheric water to prevent the exposure of dry-dependent samples to moisture. Covered with a porous material, the silica gel slowly changes from blue to pale pink as it absorbs water. The clear polystyrene base allows for visual inspection for checking gel saturation. Silica gel is inert, non-corrosive and non-toxic. Two plate sizes are available for holding 20 ml and 50 ml grams of silica gel.

Ordering Information: TransferTube & Disposable Desiccant Plates

		Part No.	Description	Size	Qty/Pkg
Laboratory Supplies	Disposables & Consumables	190195P	TransferTube Sampling Pipette	Standard Pack	250
		190195		Economy Pack	1000
		183578	Disposable Desiccant Plates	Large (50 g)	6
		183579		Small (20 g)	

NEW! KrosFlo® Research I Peristaltic Pump with Integrated Lab Stand

Spectrum's KrosFlo Research I (KRI) System combines a digital peristaltic pump and a multi-purpose lab stand to provide ultimate convenience and efficiency for experiments involving fluid circulation and transfers. The easy-to-operate digital KRI Pump drives the fluid stream through flexible tubing (sold separately) while the incorporated stand and included holders secure the tubing, filters, reservoirs and other components in place. Traditional stands often tip over, need more space and can move due to vibration. Since our stand is anchored to the pump, the KRI prevents spills, sucking air and broken connections. The Trilobite holders are designed to secure flexible tubing and cylindrical items. Standard lab clamps can also be used on the KRI stand. The molded handle on the pump makes transporting easy.

The reversible KRI pump (100 or 600 RPM) features a digital keypad that provides easy and accurate speed control. A second pump-head can be stack-mounted for increased flow or operating two parallel flow streams. Optimal flow rates can be achieved by selecting the preferred tubing size.

Features & Benefits

- Pump-mounted stand for ultimate stability
- Portable compact set-up saves space
- Easy-to-use & low maintenance
- Locking digital keypad & display
- Accurate & reliable speed control
- (Soft) Start/Stop & reversible flow
- Remote operaton by external controller
- ETL, cETL, CE, RoHS & IP33 Safety Ratings

Components

Digital Pump Drive
Rotating Pump-head
Stand Bracket
Stand Pole (46 cm)
2 Trilobite Holders
1 Reservoir Holder

Dimensions

Pump, pump-head & stand (L x W x H): 14.50" (37cm) x 10.16" (26cm) x 19.65" (50cm)

Specifications

2 Drive Types:	1-100 RPM	6-600 RPM
Flow Rates:	0.06-380 ml/min	0.36-2300 ml/min
Speed Resolution:	0.1 RPM	1 RPM
Speed Accuracy:	+/- 0.25%	+/- 0.25%
Motor Power:	75W	75W
Main Power:	90-260V 60/50Hz	90-260V 60/50Hz

Tubing Size:	13	14	16	25	17	18
OD x ID (inch):	5/32 x 1/32	3/16 x 1/16	1/4 x 1/8	5/16 x 3/16	3/8 x 1/4	7/16 x 5/16
OD x ID (mm):	4 x 0.8	4.8 x 1.6	6.3 x 3	8 x 4.8	9.5 x 6.4	11 x 8
Flow Rate (ml/min)						
100 RPM Drive:	0.06-6	0.21-21	0.8-80	1.7-170	2.8-280	3.8-380
600 RPM Drive:	0.36-36	1.3-130	4.8-480	10-1000	17-1700	23-2300

KrosFlo® Digital Pressure Monitor

Designed to monitor pressures in fluid processing, the Digital Pressure Monitor also serves as an excellent multi-purpose lab pressure monitor. The monitor measures & displays 3 pressures with warning and shut-off alarms. Great for protecting valuable and delicate samples, the triggered monitor can generate an output signal to stop any compatible lab equipment. (Does not interface with KRI Pump) The Monitor also communicates with a PC to record all process data into the provided Excel® based KF Comm Data Collection Software.

Features & Benefits

- Measures 3 pressures
- Calculates transmembrane pressure
- 5 high/low alarms & 2 auto stop set-points
- Data collection & recording
- CE & UL compliant

Components

Digital Monitor
3 Pressure Transducers & Cables
Monitor/Pump Cable
RS-232 Monitor/PC Cable
KF Comm Data Collection Software

Ordering Information: Peristaltic Pump & Digital Pressure Monitor

	Part No.	Description	Power	Qty/Pkg
Laboratory Supplies / Equipment & Instruments	ACR1-U1S-01N	KrosFlo Research I Peristaltic Pump with Integrated Stand	100 RPM, 90-260 V	1
	ACR1-U2S-01N		600 RPM, 90-260 V	
	ACR2-H3S-01N	KrosFlo Research Pump-Head with 3 SS rollers	-	
	ACPM-201-01N	KrosFlo Digital Pressure Monitor	110 V	
	ACPM-202-01N		220 V	
	ACPM-499-03N	Disposable Pressure Transducers	-	3

Bessman Tissue Pulverizer

The stainless steel Bessman Tissue Pulverizer consists of a 2 component mortar with handles and a pestle, specifically designed for pulverizing 10 – 1000 mg of tissue. After chilling the Pulverizer in liquid nitrogen, the included 28 cm lead hammer is used on the mortar to completely homogenize the inserted sample. The sample can then easily be transferred without touching or thawing by removing the mortar and inverting the pestle assembly over a test tube. The small and medium Pulverizer includes 10 test tubes and the large Pulverizer includes one culture jar.

Specifications:	Small	Medium	Large
Sample Capacity:	10-50 mg	25-250 mg	100-1000 mg
Mortar Diameter:	6.6 mm	12.7 mm	25.6 mm
Mortar Height:	26.8 mm	47.3 mm	47.6 mm

Vacu/Trol® Vacuum Water Aspirator

The Vacu/Trol Water Aspirator efficiently generates full vacuum with standard laboratory faucets (10 liters of air to < 60 mm Hg in < 6 minutes at 25 psi/1.7 bar water pressure). Constructed of stainless steel and brass with a heavy chrome finish to avoid corrosion, the aspirator has a long discharge tube to minimize splashing and can be connected to flexible tubing for directing flow, a ⅜" male NPT inlet for connecting to ⅜" female NPT faucets, and a tapered vacuum side-arm for connecting to ¼" ID x ½" OD tubing. A faucet adaptor to change the inlet connector from ⅜" male thread to ¾" female thread is sold separately.

Specifications

Length: 24.15 cm (9.51 in.)
Weight: 315 g

Gas Safety Stand for Large Cylinders

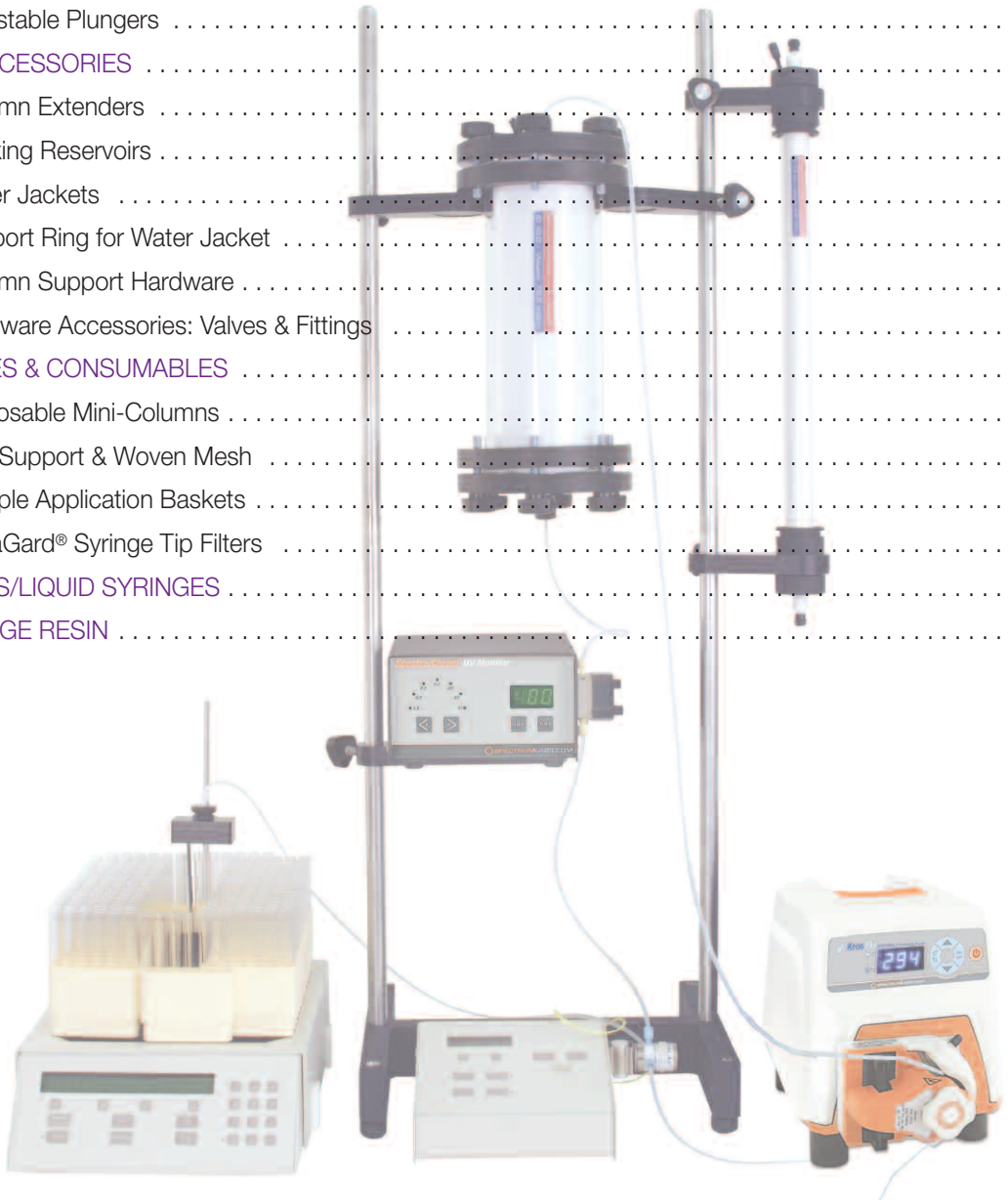
The Gas Safety Stand provides a solid base that allows large gas cylinders to be located where desired and secured in an upright position without the risk of falling. The Gas Safety Stand is suitable for gas cylinders from 18 to 25 cm in diameter.

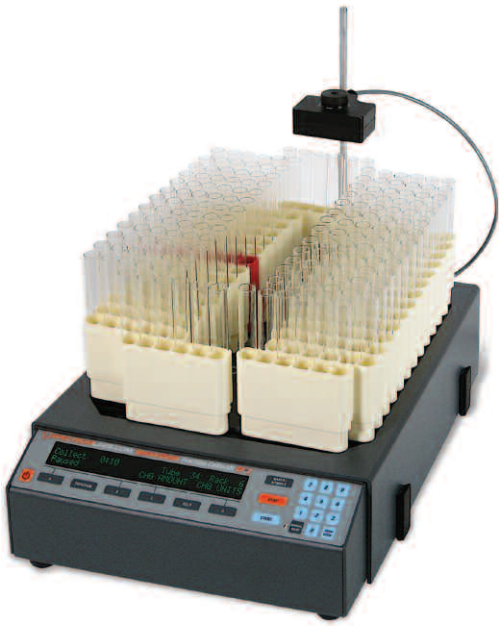
Specifications

Dimensions: 46 cm (L) x 46 cm (W) x 30 cm (H)
Weight: 15.7 kg

Ordering Information: Tissue Pulverizer, Vacu/Trol Water Aspirator & Gas Safety Stand

		Part No.	Description		Qty/Pkg
Laboratory Supplies	Equipment & Instruments	189476	Bessman Tissue Pulverizer	Large	1
		189475		Medium	
		189470		Small	
		146300	Vacu/Trol Water Aspirator	-	
		146301	Vacu/Trol Faucet Adapter	-	
		148702	Gas Cylinder Safety Stand	-	





CF-2 Fraction Collector

Sold complete and ready-to-use, the CF-2 is the perfect collector for both large volume open column chromatography and preparative HPLC. The CF-2 Fraction Collector includes a drop counter and a set of racks for up to 174 tubes (12 to 13 mm OD). Cold-room compatible, the CF-2 uses less than 10 watts of power and presents a minimal load to the cooling system while keeping its interior free of condensation. The sturdy aluminum and stainless steel construction assures you of many years of reliable operation. When connected to the Spectra/Chrom® Model 280 UV Monitor the CF-2's powerful peak separator allows you to set different fraction sizes for the peak and non-peak materials. When using the optional diverter valve, you can opt to collect only the peak fractions to maximize the utility of each tube and reduce your post-collection work. Locating the tube for each peak is easy when the Spectra/Chrom® Model 280 UV Monitor is used with the CF-2 Fraction Collector, a tick mark placed on the recorder trace marks each tube change. Optional tube rack sets are available for a variety of different tube sizes.

Features & Benefits

- Fractions sized by time, drop count or volume count
- Interfaces with most detectors
- Includes tube racks for 174 fractions
- CE marked & complies with RoHS

Product Specifications

Dimensions:	28 x 12 x 38 cm
Weight:	5 kg (10 lb)
Fraction Size:	1-9999 drops in 1 drop increments or 6 sec – 999 min; 59 sec in 1 sec increments
Change Rate:	0.35 sec max within 12/13 mm tube rack
Operating Temp:	0–40 °C (cold-room compatible)
Power:	115 VAC or 230 VAC, 50/60 Hz

IS-95 Interval Sampler

Ideal for QC sampling & reactor testing, the IS-95 Interval Sampler collects periodic samples of liquids. Simply provide the interval for sampling & the sample size and it does the rest. It has the capability to control either a valve for sampling from a low pressure line or elevated tank, or a pump when the sample has to be lifted to be collected. The IS-95 Interval Sampler includes a drop counter & drop former that allows you to size your samples based on either the number of drops or on the duration of collection. If large samples are required, you can have a single collection span several tubes. The IS-95 Interval Sampler also includes remote control capability that allows you to start & stop the sampler, as well as follow its collection progress from an external controller. The IS-95 can collect up to 173 samples in 12 or 13 mm OD tubes in a single set of racks. The rack set is not included & must be purchased separately. See ordering information for the range of available rack sizes.

Features & Benefits

- Programmable volume or time sampling
- Up to 173 samples in 12 to 13 mm tubes
- Tube sizes from 10 to 28 mm OD
- Remote operation by external controller
- CE marked & complies with RoHS

Product Specifications

Dimensions:	28 x 12 x 40 cm
Weight:	5 kg (10 lb)
Sample Size:	1-9999 drops in 1 drop increments or 6 sec–999 min; 59 sec in 1 sec increments
Sample Interval:	6 sec–999 min; 50 sec in 1 sec increments
Operating Temp:	0–40 °C (cold-room compatible)
Power:	115 VAC or 230 VAC, 50/60 Hz

Ordering Information: Chromatography Instruments (Fraction Collector & Interval Sampler)

Chromatography Instruments

Fraction Collector

Part No.	Description	Voltage	Includes:
124845	**CF-2 Fraction Collector**	115 V, 50/60 Hz	rack set (124853) & drop counter
124846		230 V, 50/60 Hz (CE & RoHS)	

Interval Sampler

Part No.	Description	Voltage	Includes:
141200	**IS-95 Interval Sampler**	115 V, 50/60 Hz	drop counter requires rack set for operation
141202		230 V, 50/60 Hz (CE & RoHS)	

Accessory Parts

Part No.	Description	Qty	For Use With:
124838	**High Flow Diverter Valve:** Diverts flow from CF-2 to waste between fraction collections and at end of run. Allows for unattended fraction collection. PTFE wet-contact materials. Flow rates up to 100 ml/min.	1/pkg	CF-2 & IS-95
124848	**2-Way Shut-off Valve:** Ideal for use with radioactive or toxic materials, stops flow to CF-2 during tube change and at end of the run to avoid missing drops. Not recommended for use with pumped system without auto-stop control. (Caution should be taken, not guaranteed to prevent all errant drops.)		
124849	**3-Way Diverter Valve:** Diverts flow from CF-2 to waste between fraction collections and at end of run. Allows for unattended fraction collection. PTFE wet-contact materials. Flow rates up to 20 ml/min.		
124853	**Racks for 12 & 13 mm Tubes:** up to 174 fractions for CF-2 or 173 samples for IS-95 Standard 13 mm diameter x 100 mm tall tubes can hold up to 10 ml	30 racks/set	
124854	**Racks for 10 to 16 mm Tubes:** up to 116 fractions for CF-2 or 115 samples for IS-95 Standard 16 mm diameter x 150 mm tall tubes can hold up to 23 ml		
124855	**Racks for 17 & 18 mm Tubes:** up to 116 fractions for CF-2 or 115 samples for IS-95 Standard 18 mm diameter x 150 mm tall tubes can hold up to 27 ml		
124856	**Racks for 28 mm Scintillation Vials:** up to 42 fractions for CF-2 or 41 samples for IS-95	15 racks/set	
124858	**Dust Cover for Fraction Collector:** Reduces risk of airborne contamination; removable without disturbing electrical and fluid connections; clear acrylic	1/pkg	
124874	**Mast Package for Fraction Collector:** Adds two 50 cm long masts to rear of CF-2 or IS-95 for additional small column or instrument support and conserving bench space. These masts can be used to save bench space by supporting small columns or instruments without the use of a separate ring stand.	1/pkg	CF-2
124876	**4-Column Adaptor (requires mast package):** Allows the collection of 4 separate fractions simultaneously from 4 different columns (29 fractions/column). Includes special 4 place tube racks and quadruple drop head. (Mast Package required to support quadruple drop head).		

Spectra/Chrom® Model 280 UV Monitor

The Spectra/Chrom Model 280 UV Monitor is a fixed-wavelength flow-through spectrophotometer, ideal for chromatographic detection in both HPLC and low pressure systems. The Model 280 features a direct reading digital output and a dual-beam optical system that can automatically subtract even a rapidly changing solvent background. This detector works with the CF-2 Fraction Collector to separate the peak and non-peak material or, if preferred, to collect only the peaks. The Spectra/Chrom® Model 280 UV Monitor also provides analog outputs for both the Spectra/Chrom® Chart Recorder and an integrator. Sold complete & ready-to-use, the Model 280 UV Monitor includes a 5 mm path-length flow-cell, filters for 254 & 280 nm operation, a set of tubing fittings and recorder cable.

Features & Benefits

Dual-beam optics for baseline subtraction
254 & 280 nm operation (<10 sec change)
3 x 10^{-4} AU detection limit
CE marked & complies with RoHS

Product Specifications

Dimensions / Weight:	24 x 12 x 20 cm / 4.1 kg (9 lb)
Stability after 30 min:	0.0005 AU/hr maximum drift
Noise after 30 min:	<0.0003 AU at 254 nm with dry flow-path
Absorbance Range:	0.01–1.0 AU full-scale
Operating Temp:	0–40°C (cold-room compatible)

Spectra/Chrom® Chart Recorder

The ideal complement to the Model-280 UV Monitor, the Spectra/Chrom Chart Recorder is an all-purpose laboratory strip-chart recorder used to record chromatograms and other time-varying signals. The Chart Recorder holds 15 meters of paper for extended recording times and to reduce the frequency of paper changes. Can be set to calibrated or variable scales. The zero point can be positioned anywhere using the zero offset.

Features & Benefits

12 chart speeds from 1 cm/hr to 30 cm/min
Zero Offset for chart repositioning
Compatible with Model-280 UV Monitor
CE marked & complies with RoHS

Product Specifications

Full Scale Span:	1, 2, 5, 10, 20, 50 mV, .1, .2, .5, 1, 2 and 5 V
Full-Scale response:	< 0.5 sec
Pen Type:	Disposable fiber tip
Chart Speeds:	1, 2, 5, 10, 20, 30 cm/hr & cm/min
Paper Dimensions:	15 m long x 20 cm wide

S-3 Solvent Saver System

The microprocessor controlled S-3 is a solvent recycler specifically designed to reduce isocratic solvent consumption by up to 90% for both LC and HPLC, providing a significant savings in both solvent acquisition and disposal costs. It uses a sensitive level sensor to shunt the eluant to waste when the detector indicates something is coming off of the column. After the contaminant (typically a sample component) passes and the output from the system detector drops below the threshold you set then the uncontaminated solvent is routed back to the solvent reservoir for re-use. The S-3 works equally well with UV, RI and other detectors with chart recorder outputs, handles up to a 50% over-range and continuously displays its status and signal level. The recycle valve can also be set manually or remotely to remain in either the recycle or waste position which is indicated by the Q.A. validation signal. The S-3 Solvent Saver comes complete with control console, valve, signal cable and tubing fittings.

Features & Benefits

Works with both UV and RI detectors
Q.A. validation signal
Both manual & automatic operation
CE marked & complies with RoHS

Product Specifications

Dimensions:	6.7 x 4 x 8.3 cm
Weight:	1 kg (0.5 lb)
Input:	1 V or 10 mV full-scale (user selectable)
Set Point:	0-0.5 V in 0.01 V steps or 0-5 mV in 0.1 mV steps
Remote Inputs:	Contact closure or TTL low inputs for forced waste, forced recycle & auto-zero
Remote Output:	Open collector output to verify valve operation
Hysteresis:	0-9.9% full-scale in 0.1% steps
Operating Temp:	0-40°C (cold-room compatible)

Ordering Information: Chromatography Instruments (UV Monitor, Chart Recorder & Solvent Saver System)

Chromatography Instruments

	Part No.	Description	Voltage	Includes:
UV Monitor	142600	UV Monitor, Model 280	115 V, 50/60 Hz	5mm path-length flow-cell
	142602		230 V, 50/60 Hz (CE & RoHS)	
Chart Recorder	124700	Chart Recorder, Single Pen	115 V, 50/60 Hz	1 pen & 1 roll of paper
	124701		230 V, 50/60 Hz (CE & RoHS)	
	124705	Chart Recorder, Dual Pen	115 V, 50/60 Hz	Set of pens & 1 roll of paper
Solvent Saver	124706		230 V, 50/60 Hz (CE & RoHS)	
	142100	S-3 Solvent Saver System	115 V, 50/60 Hz	Signal cable & valve
	142102		230 V, 50/60 Hz (CE & RoHS)	

	Part No.	Description	Qty	For Use With:
Accessory Parts	142610	Mast Bracket for Model 280	1/pkg	UV Monitor Model 280
	142615	Model 280 to CF-2 Cable, for event marking		
	142625	Model 280 Universal Remote Cable		
	142630	Model 280 Cable for event marking		
	142640	10 mm Path-length PEEK Flow-cell		
	142642	5 mm Path-length PEEK Flow-cell		
	142644	2 mm Path-length PEEK Flow-cell		
	124710	Trace Paper	15 m/roll	Chart Recorder
	124711	Red pen for pen 1 (short)	1/pkg	Dual Pen Chart Recorder
	124712	Blue pen for pen 2 (long)		
	124714	Black Pen	1/pkg	Single Pen Chart Recorder

NEW! KrosFlo® Research I Peristaltic Pump

The new digital KrosFlo Research I (KRI) Pump is ideal for low-pressure liquid chromatography, providing sufficient flow and pressure limits equivalent to open glass columns (35 psi, 2.4 bar). Available in 100 and 600 RPM models, both pumps include a pump-head with rotating rollers that compress against flexible tubing to efficiently drive fluid forward. The 100 RPM pump generates lower flow rates for smaller columns (≤ 2.5 cm diameter), while the 600 RPM pump generates higher flow rates for larger columns or other general fluid transfers. The simple digital keypad and display provides easy and accurate control of pump speed and flow direction. Combined with the suitable tubing size, optimal flow rates can be achieved for all lab chromatography applications. The KRI Pump can be controlled by the CF-2 Fraction Collector to stop the pump at the end of a run to save solvent and reduce waste.

Features & Benefits

- Easy-to-use & low maintenance
- Portable small foot-print design
- Includes easy loading pump head
- Splash-resistant digital keypad & display
- Accurate & reliable digital speed control
- (Soft) Start/Stop & Reversible
- Remote operaton by external controller
- Universal voltage for world-wide operation
- ETL, cETL, CE, RoHS & IP33 Safety Ratings

Pump Drive Specifications

2 Drive Types:	1-100 RPM	6-600 RPM
Flow Rates:	0.06-380 ml/min	0.36-2300 ml/min
Speed Resolution:	0.1 RPM	1 RPM
Speed Accuracy:	+/- 0.25%	+/- 0.25%
Motor Power:	75W	75W
Mains Power:	90-260V 60/50Hz	90-260V 60/50Hz
Dimensions:	28 x 21 x 22 cm	28 x 21 x 22 cm

Pump Head Specifications

Tubing Size:	13	14	16	25	17	18
OD x ID (inch):	5/32 x 1/32	3/16 x 1/16	1/4 x 1/8	5/16 x 3/16	3/8 x 1/4	7/16 x 5/16
OD x ID (mm):	4 x 0.8	4.8 x 1.6	6.3 x 3	8 x 4.8	9.5 x 6.4	11 x 8
Flow Rate (ml/min)						
100 RPM Drive:	0.06-6	0.21-21	0.8-80	1.7-170	2.8-280	3.8-380
600 RPM Drive:	0.36-36	1.3-130	4.8-480	10-1000	17-1700	23-2300

NEW! KrosFlo® Research Pump-Head

An additional KrosFlo Research Pump-head can be purchased and stack-mounted on the existing pump-head to run 2 columns simultaneously. The quick and easy-to-load pump-head can be used with any flexible tubing with an outer diameter up to 7/16 inch (11.1 mm) and a wall thickness of 1/16 inch (1.6 mm).

Ordering Information: Peristaltic Pumps

	Part No.	Description	Model	Voltage
Peristaltic Pumps	124868	KrosFlo Research I Peristaltic Pump (includes pump-head)	100 RPM	90-260V 50/60Hz
	146821		600 RPM	
	ACR2-H3S-01N	KrosFlo Research Pump-Head		

Spectra/Chrom® Flexible Tubing

Spectrum manufactures flexible peristaltic pump tubing from 3 different materials, low pressure silicone (LPS), low pressure vinyl (LPV) and low pressure fluoroelastomer (LPF). The 15 and 30 meter lengths of tubing come in easy dispensing shelf boxes that include a Spectra/Chrom Tubing Cutter. Polyethylene and PTFE tubing is also available for general laboratory use (not recommended for use with peristaltic pump).

Peristaltic Tubing	Best For	Pumping Life
LPS	most solvents	500 hrs @ 100 RPM
LPV	aqueous solvents	200 hrs @ 100 RPM
LPF	organic solvents	100 hrs @ 100 RPM

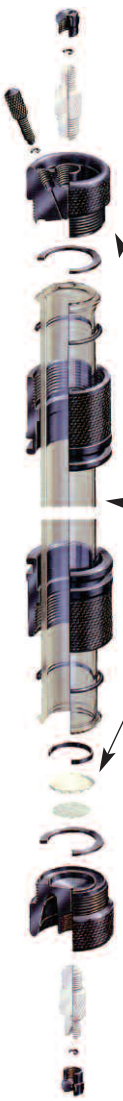
Ordering Information: Chromatography Flexible Tubing

	Tubing Dimension (inches)				Vinyl (LPV)		Silicone (LPS)		LPF	Polyethylene		PTFE	
	Size	OD	ID	Wall									
Flexible Tubing	-	1/16	0.010	0.025	-	-	-	-	-	-	-	123798	123800
			0.021	0.020	-	-	-	-	-	-	-	123802	123804
			1/32	1/64	-	-	-	-	-	-	-	123806	123808
			0.038	0.012	-	-	-	-	-	-	-	123810	123812
	-	0.85	0.020	1/32	123700	123702	123704	123706	123708	123710	123712	-	-
	-	1/8	1/32	3/64	-	-	-	-	-	-	-	123814	123816
			1/16	1/32	123714	123716	123718	123720	123722	123724	123726	123818	123820
			0.085	0.020	-	-	-	-	-	-	-	123822	123824
			0.106	0.010	-	-	-	-	-	-	-	123826	123828
	13	5/32	1/32	1/16	123728	123730	123732	123734	123736	123738	123740	-	-
	14	3/16	1/16	1/16	123742	123744	123746	123748	123750	123752	123754	-	-
	16	1/4	1/8	1/16	123756	123758	123760	123762	123764	123766	123768	123830	123832
	-	1/4	3/16	1/32	123770	123772	123774	123776	123778	123780	123782	123834	123836
	15	3/8	3/16	3/32	123838	123840	123842	123844	123846	123848	123850	-	-
	17	3/8	1/4	1/16	123852	123854	123856	123858	123860	123862	123864	-	-
	18	7/16	5/16	1/16	123784	123786	123788	123790	123792	123794	123796	-	-
	-	1/2	5/16	3/32	-	-	123888	123890	-	-	-	-	-
	-	1/2	3/8	1/16	-	-	123892	123894	-	-	-	-	-
				Qty	3m	30m	3m	15m	3m	3m	30m	3m	30m

Spectra/Chrom® Tubing Cutter

The Spectra/Chrom® Tubing Cutter easily cuts most plastic tubing with ½" (13 mm) OD or smaller. The special "V" shape of the tubing holder keeps the tubing perpendicular to the blade to provide a flat, even cut surface. Replacement blades are also available (5/pkg)

Part No.	Description	Qty
123367	Spectra/Chrom Tubing Cutter	1/pkg
123368	Replacement Blades for Tubing Cutter	5/pkg



Spectra/Chrom® Chromatography Columns

Spectra/Chrom® Columns are versatile, state of the art columns intended for high-quality, classical chromatographic separations using gravity or moderate pressure. There are 2 series of columns to select from depending on the elution chemistry.

1. **Aqueous Columns**
   For use with standard buffers
2. **Organic Columns**
   For use with organic solvents

Column Features

- Use with aqueous and organic solvents
- Wide range of standard sizes
- Non-clogging, high resolution bed supports
- Ascending or descending flow
- Injection/Vent port in upper end-plate

Column End-plates

Made of polypropylene for aqueous columns and PTFE for organic columns, both upper and lower end-plates accept a variety of tubing connectors, special purpose connectors or valves. A set of Multifit Tubing Connectors is included with each column. The upper end-plate also has a multi-purpose vent port that can be used as an air bleed, a sample port or a means to connect optional fittings for introduction of a second fluid stream.

Column Bodies

Made of borosilicate glass and resistant to almost any chromatographic solvent, the column bodies are available in a wide range of diameters, 6–150 mm (¼– 6 in.), and standard lengths, 10- 200 cm (4 –80 in.). Longer columns with a continuous inner bore can be created by using the column extenders to join multiple lengths.

Column Bed Support

All columns & optional adjustable plungers are constructed with non-clogging bed supports made from a thin 10 µm membrane layered over a coarse 50 µm woven grid. This 2 layer membrane reduces the likelihood of clogging, especially when compared to a porous packing support. The coarse grid supports the membrane and minimizes the loss of resolution that can occur when a band passes from the large column bore to the small bore of the outlet tubing.

Column Selection Guide

Size Feature	Purpose	Benefit
Long Columns:	fractionation	high resolution
Large Diameters:	preparative chromatography	large volume capacity
Small Columns:	ion exchange & affinity chromatography	resolution & capacity controlled by elution media
Elution Chemistry	**Column Materials**	**Benefit**
Aqueous Column:	glass, nitrile rubber & polypropylene	economic
Organic Column:	glass & inert PTFE	resistant to organic solvents

Adjustable Plungers

Used in place of one or both end-plates, Spectrum's Adjustable Plungers are bed supports that allow you to adjust the bed height for your particular needs. They are especially useful for reverse (ascending) flow, in-stream injection, conserving gel packing and important bed height exactness. The plunger's 2-layer bed support is the same as the column's, consisting of a 10 µm mesh supported by a 50 µm woven grid to provide a non-clogging support that minimizes eluant band spreading. There are 2 plunger designs based on size, both free of mixing cavities and dead-space.

Small column ID (0.6 – 2.5 cm): Standard capillary passage from the plunger face to an external fitting

Large column ID (5.0 - 15 cm): Tubing through shaft from fitting on back of plunger face to an external fitting

Aqueous and Organic Plungers: available to match the column series & elution chemistry

Elution Chemistry	Small Column Seal	Large Column Seal
Aqueous Plunger:	non-expanding Viton® O-ring	expanding Viton® O-ring
Organic Plunger:	non-expanding Viton® O-ring	expanding Viton® O-ring w/ PTFE shield

Ordering Information: Chromatography Columns & Adjustable Plungers

Chromatography Columns

	Length (cm)	Column Diameter (cm) 0.6	0.9	1.5	2.5	5	7.5	10	15
Aqueous	10	123903	123950	123952	123956	123972	-	-	-
	15	123900	124000	123954	123955	124035	-	-	-
	20	123905	124001	124008	124021	123974	-	-	-
	30	123910	124002	124010	124022	124036	124046	124052	124058
	40	123915	124003	124012	124024	-	-	124053	-
	45	-	-	-	124026	-	123975	-	124059
	50	123920	124004	124013	124027	124037	-	123963	-
	60	123925	124005	124014	124028	124038	124047	124054	124060
	70	123930	123960	124016	124030	-	-	124055	-
	75	-	-	-	-	-	-	-	124061
	80	123935	123961	124017	124031	-	-	123964	-
	90	123940	123962	124018	124032	124040	124048	123965	123970
	100	123945	124006	124020	124034	124042	124049	123966	-
	120	-	-	-	123958	124043	124050	124056	124062
	150	-	-	-	-	124044	124051	123967	124064
	200	-	-	-	-	-	-	-	124066
Organic	10	-	125000	124970	125024	125036	-	-	-
	15	124900	125001	124971	-	-	-	-	-
	20	124905	125002	125009	125022	124983	-	-	-
	30	124910	125003	125011	125023	125037	125047	125053	125059
	40	124915	125004	125013	125025	-	-	125054	-
	45	-	-	-	125027	-	-	-	125060
	50	124920	124950	125014	125028	-	-	124953	-
	60	124925	125005	125015	125029	125039	125048	125055	125061
	70	124930	125006	125017	125031	-	-	125056	-
	75	-	-	-	-	-	-	-	125062
	80	124935	124951	125018	125030	-	-	124954	-
	90	124940	124952	125019	125033	125041	125049	124955	124959
	100	124945	125007	125021	125035	125043	125050	124956	-
	120	-	-	-	-	125044	125051	125057	125063
	150	-	-	-	-	125045	125052	125058	125065
	200	-	-	-	-	-	-	-	125067

Adjustable Plungers

	Part No.	Column ID (cm)	Adjustable Length (cm)
Aqueous	124101	0.6	10
	124100	0.9	
	124108	1.5	
	124122	2.5	16
	124136	5.0	32
	124142	7.5	
	124146	10	
	124152	15	
Organic	125100	0.6	10
	125101	0.9	
	125109	1.5	
	125123	2.5	16
	125139	5.0	32
	125141	7.5	
	125147	10	
	125149	15	

Related Products:

Column Extenders pg 78
Packing Reservoirs pg 78
Water Jackets pg 78
Support Hardware pg 80
Valves & Fittings pg 80
Column Bed Supports pg 82

Column Extenders

Column Extenders are frequently used to facilitate packing chromatography columns with soft media. They securely connect two columns with the same ID end-to-end to accommodate a large volume of dilute gel slurry. As the buffer drains, the extended column minimizes convection currents that commonly occur with funnels, allowing the gel to settle evenly and providing a uniform packing. To pack gels that require pressure, attach an upper end-plate to the upper column and drive packing buffer through the column with an MP-1 Peristaltic Pump. After the gel is sufficiently packed, the upper column and Column Extender are removed and the lower packed column is ready for use.

Spectrum offers two types for different elution chemistries:

Polypropylene Extenders for Aqueous Columns
PTFE Extenders for Organic Columns

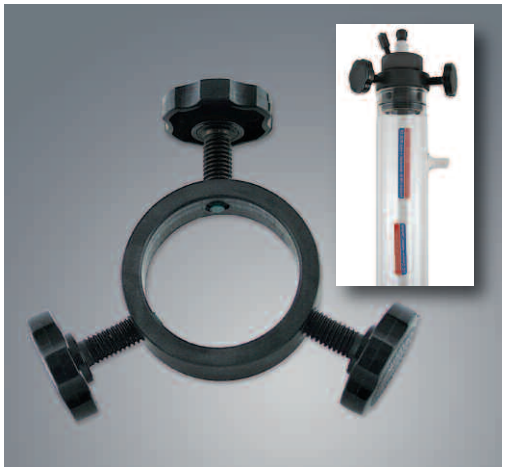
Packing Reservoirs

As an alternative to using a second column for slurry packing, a Packing Reservoir can be attached to the top of a column with a Column Extender to smoothly extend the inner bore of the column and minimize disruption of the packed bed. The spherical body of the packing reservoir reduces the height requirements (as compared to using a second column) while the neck of the reservoir matches the column size to minimize eddy currents.

The Packing Reservoir can also be used as a solvent reservoir for a gravity driven separation. Simply attach an upper end-plate to the reservoir and then connect the end-plate to a column with a length of flexible tubing. The spherical shape of the reservoir reduces the rate of changing head pressure as the solvent passes through the column.

Water Jackets

Spectrum offers removable glass Water Jackets for controlling the temperature of the column packing. Available for columns with dimensions ranging from 0.6 cm ID x 15 cm L to 5.0 cm ID x 150 cm L, the jacket easily slips over the column and is secured by clamping to a stand. Water is circulated through the jacket via two ¼" hose barbs. The tooled ends assure a tight fit while the nitrile O-Rings prevent water leakage. Depending on the column diameter, a Support Ring (sold separately) may be recommended to secure the chromatography column.



Support Ring for Water Jacket

For column diameters of 2.5 cm or larger, a support ring should be attached to the upper column collar to prevent the column from slipping through the Water Jacket. The Support Ring is not necessary for column diameters of 1.5 cm or less since the end plate design is sufficient to support the column.

Related Products:

Spectra/Chrom® Chromatography Columns pg 76
Adjustable Plungers pg 76
Column Support Hardware pg 80

Ordering Information: Column Accessories (Column Extenders, Packing Reservoirs, Water Jackets & Support Rings)

Column Accessories

Column Extenders

Part No.	Column ID	Type	Qty
124339	0.6 cm	Aqueous Columns	1/pkg
124340	0.9 cm		
124342	1.5 cm		
124344	2.5 cm		
124346	5.0 cm		
124347	7.5 cm		
124348	10 cm		
125352	0.6 cm	Organic Columns	1/pkg
125353	0.9 cm		
125355	1.5 cm		
125357	2.5 cm		
125359	5.0 cm		
125360	7.5 cm		
125361	10 cm		

Packing Reservoirs

Part No.	Column ID	Volume	Qty
124352	0.6 cm	125 ml	1/pkg
124354	0.9 cm	300 ml	
124356	1.5 cm	300 ml	
124358	2.5 cm	1000 ml	
124360	5.0 cm	3000 ml	
124361	7.5 cm	5000 ml	
124362	10 cm	5000 ml	

Water Jackets

Length (cm)	Column Inner Diameter (cm) 0.6	0.9	1.5	2.5	5.0
15	123200	124280	-	-	-
20	123201	124281	124288	124301	124317
30	123202	124282	124290	124302	124316
40	123203	124283	124292	124304	-
50	123204	123212	124293	124307	-
60	123205	124284	124294	124308	124318
70	123206	124285	124296	124310	-
80	123207	123213	124297	124311	-
90	123208	123214	124298	124312	124320
100	123209	124286	124300	124314	124322
120	-	-	-	124315	124323
150	-	-	-	-	124324

Support Rings

Part No.	Column ID	Qty
124326	1.5 cm	1/pkg
124328	2.5 cm	
124330	5.0 cm	

Column Support Hardware

Spectrum offers a broad selection of accessories for supporting chromatography columns with a wide range of diameters and lengths; including lab stands, support rods, bases, rings and other weight-bearing equipment.

Selection Guide for Support Hardware Based on Column Size

Column Diameters	Column Length	Support Stand System (longer rods sold separately)	Column Support Rings	Mounting Insert Kit
0.6 cm 0.9 cm 1.5 cm & 2.5 cm	< 30 cm	Bench Top Mini-stand (incl. one 50 cm Support Rod)	Two 2.5 cm Support Rings	Kit for appropriate column diameter (Kit not required for 2.5 cm dia. column)
	30 - 90 cm	Bench Top Work Station (incl. two 100 cm Support Rods)		
	> 90 cm	"H" Base & Set of Support Rods, 150 cm		
5.0 cm	< 90 cm	Bench Top Work Station (incl. two 100 cm Support Rods)	Two 5.0 cm Support Rings	None required
	90 – 120 cm	"H" Base & Set of Support Rods, 150 cm		
	> 120 cm	Floor Model Work Station & 200 cm instrument rod		
7.5 cm 10 cm & 15 cm	< 60 cm	Bench Top Work Station (incl. two 100 cm Support Rods)	Two 2.5 cm Support Rings	Mounting Insert Kit for 7.5 – 15 cm dia.
	> 60 cm	Floor Model Work Station & Set of Telescoping Rods of appropriate length	None required	None required

Note: Support rods should always be at least 20 cm longer than the column. Telescoping rods should match the column length exactly.

Hardware Accessories: Valves & Fittings

Spectrum offers an assortment of Valves & Fittings for chromatography columns to make tubing connection, flow control and sample injection easier. Valve & fitting sizes should match tubing OD to ensure tight seals.

Multifit Connectors

Spectrum offers two types of Multifit Connectors for connecting flexible tubing to the column end-plates: Aqueous Series with an O-ring for gripping the tubing and Organic Series with a PTFE ferrule. Neither connector type is designed for use above 50 psi.

Multifit Valves

This valve with its own Multifit connector serves to replace the standard tubing fitting by connecting to the flexible tubing and screwing directly into the column end-plate.

Metering Valves

Instead of altering reservoir heights which can be cumbersome, in-line Metering Valves provide a simple and convenient means to control the flow rate for gravity-fed chromatography.

Sample Injection Fittings

The simplest method to introduce a sample for chromatographic separation is using a syringe and needle to pierce the septum of a Sample Injection Fitting. Two types are available depending on the preferred location for injection. The first type has ⅛" inlet / outlet compression fittings and is placed "In-Line" with the tubing. The second type screws directly into the column upper end-plate to replace the Multifit Connector with 2 sizes for connecting to either ⅛" or 3/16" OD tubing.

Ordering Information: Column Accessories (Column Support Hardware, Valves & Fittings)

Column Support Hardware

Bench Top Stand

Part No.	Description	Rod Length (cm)	Qty
123321	Bench Top Mini-stand with single rod	50	
123320	Bench Top Work Station with 2 rods	100	1
123322	H-Base Stand, holds up to 4 rods, rods not included	-	
123324	Rods for use with H-Base Stand	15	set of 2
123326		30	
123328		50	
123330		100	
123331		150	

Part No.	Description	Column ID (cm)	Qty
123334	Column support ring (2 required)	2.5	1
123353	Insert kit for 123334, 1 insert kit and 2 rings required per column	0.6	1 kit
123354		0.9	
123355		1.5	
123317		7.5 to 15	
123339	Column support ring (2 required)	5	1

Floor Stand

Part No.	Description	Column Length (cm)	Qty
123300	Floor Model Work Station		1
123302	Set of Telescoping rods for use with the Floor Model Work Station, Length of column must match rod length. Only 1 set of rods required per column. Only for 7.5 cm diameter and larger columns.	30	set of 2
123303		40	
123305		50	
123304		60	
123307		70	
123309		80	
123306		90	
123308		100	
123310		120	
123312		150	
123314		200	
123318	Replacement mounting pin set for Floor Model Work Station	-	4/pkg

Hardware Accessories

Connectors

Part No.	Description	Tubing OD (in.)	Qty
124380	Column Multifit Connector, Aqueous	1/16	1/pkg
124384		1/8	
124391		3/16	
124390		1/4	
124487	Column Multifit Connector, Organic	1/8	
124489		3/16	
124488		1/4	
124491		1/2	

Valves

Part No.	Description	Tubing OD (in.)	Qty
124414	Column Multifit Shut-off Valve	1/16	1/pkg
124420		1/8	
124426		1/4	
124432	Column Metering Valve	1/8	
124508	In-line Metering Valve	1/8 to 1/8	
124514		1/8 to 1/4	

Fittings

Part No.	Description	Tubing OD (in.)	Qty
124474	In-line Injection Fitting	1/8 to 1/8	1/pkg
124376	Column Injection Fitting	1/8	
124378		3/16	
124576	Replacement Silicone Septa		6/pkg
124579	Replacement PTFE lined Silicone Septa		

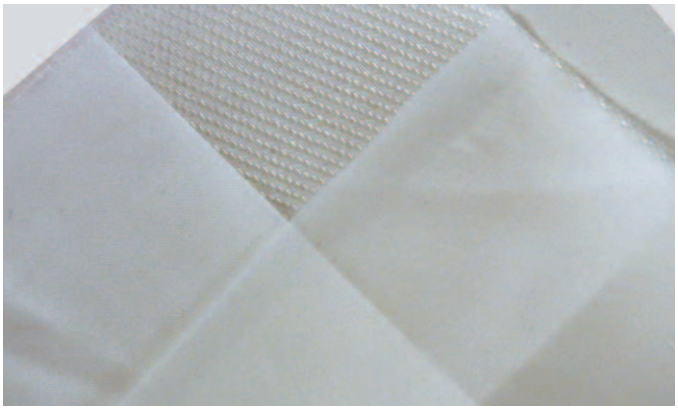
Disposable Mini-Columns

Spectrum's Disposable Mini-Columns are ideal for economic chromatographic separations that require speed and simplicity such as sample preparation, desalting and concentration. Designed with a wide-brimmed reservoir to make packing quick and easy, the Mini-Columns are available in 2 column body materials; clear polystyrene for visibility and translucent polypropylene for solvent resistance. 3 bed support porosities are available to accommodate a variety of media.

Product Specifications

2 Materials:	Ultra-pure polystyrene Ultra-pure polypropylene
Bed Support:	Polyethylene (15, 45 & 90 µm)
Packaging:	20/pkg

Dimensions:	Column	Reservoir
Volume:	3 ml	4.5 ml
Length:	6 cm	3.5 cm
ID x OD:	8 x 10 mm	13 x 15 mm



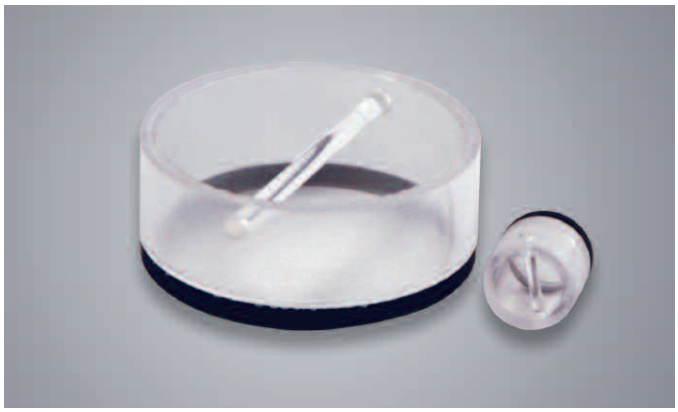
Bed Support & Woven Mesh

The 2 layer bed supports used in our Aqueous and Organic series chromatography columns are field replaceable. The 10 micron inner mesh is held in place with a plastic ring, simply take a new piece of mesh, snap it in place with the ring, and trim the excess with a sharp blade. Make sure the piece you start with is at least a little bigger than the column diameter.

The 50 µm coarse woven mesh is pre-cut for each column size. This is layered beneath the 10 µm bed support and used to maintain the column resolution.

Product Specifications

3 Material Types:	Nylon, PTFE & polypropylene
2 Mesh Openings:	10 µm & 50 µm
3 Pkg. Dimensions:	4 x 4 in. square, 6 x 6 in. square, 1 sq. yd.



Sample Application Baskets

The Sample Application Basket is specifically designed for laying a sample on the column bed. The basket consists of a clear acrylic shell with an open top and a replaceable 10 µm nylon mesh base. Use a wire hook to submerge and maneuver the basket beneath a layer of buffer onto the gel bed. (Baskets are not for use with organic solvents.)

Product Specifications

8 Column Dia. Sizes:	0.6, 0.9, 1.5, 2.5, 5.0, 7.5, 10 & 15 cm
Basket:	Acrylic
Base:	10 µm nylon mesh

Ordering Information: Disposables & Consumables (Mini-Columns, Woven Mesh & Sample Baskets)

Chromatography Disposables & Consumables

Disposable Mini-Columns

Part No.	Description	Material	Pore Size	Qty
104700	Disposable Mini-Columns	Polystyrene	90 µm	20/pkg
104701			45 µm	
104702			15 µm	
104703		Polypropylene	90 µm	20/pkg
104704			45 µm	
104705			15 µm	

Woven Mesh

Part No.	Description	Material	Mesh Opening	Size
124080	Bed Support Cloth	Nylon	10 µm	4 x 4 in.
124082				6 x 6 in.
124084				1 sq.yd.
124086		PTFE	10 µm	4 x 4 in.
124088				6 x 6 in.
124090				1 sq.yd.
524006	Flow Dispersing Grid	PTFE	50 µm	For 0.6 cm diameter aqueous or organic series column
524009				For 0.9 cm diameter aqueous or organic series column
524015				For 1.5 cm diameter aqueous or organic series column
524025				For 2.5 cm diameter organic series column
524050				For 5 cm diameter organic series column
524075				For 7.5 cm diameter organic series column
524110				For 10 cm diameter organic series column
524115				For 15 cm diameter organic series column
124025		Polypropylene		For 2.5 cm diameter aqueous series column
124500				For 5 cm diameter aqueous series column
124075				For 7.5 cm diameter aqueous series column
124110				For 10 cm diameter aqueous series column
124115				For 15 cm diameter aqueous series column

Sample Application Baskets

Part No.	Description	Column ID	Qty
124261	Sample Application Basket	0.6 cm	1/pkg
124262		0.9 cm	
124264		1.5 cm	
124266		2.5 cm	
124268		5.0 cm	
124269		7.5 cm	
124270		10 cm	
124272		15 cm	

DynaGard® Syringe Tip Filters

Ideal for HPLC and chromatography, DynaGard's looped hollow fiber membrane maximizes surface area while reducing membrane plugging. The narrow housing device minimizes hold-up volume and easily withdraws & dispenses from ampules & test tubes. Available with either 0.2 µm hydrophilic mixed cellulose ester (ME) fibers for use with aqueous solutions or 0.2 µm hydrophobic polypropylene (PP) fibers for use with organic solvents and alcohols.

	ME DynaGard®			PP DynaGard®	
Housing:	Polycarbonate (blue)			Polypropylene (white)	
HF Membrane:	Hydrophilic Mixed Cellulose Ester (ME)			Hydrophobic Polypropylene (PP)	
Potting:	Epoxy			Epoxy	
Specifications:	**3 Sizes**			**2 Sizes**	
Membrane SA:	2.5 cm^2	3.4 cm^2	5.5 cm^2	0.8 cm^2	3.9 cm^2
Filtration Volume:	< 5 ml	1 – 10 ml	5 – 20 ml	< 5 ml	5 – 20 ml
Hold-up Volume:	< 18 µl	< 23 µl	< 35 µl	< 8 µl	< 30 µl
Pore Rating:	0.2 µm	0.2 µm	0.2 µm	0.2 µm	0.2 µm
Housing Length:	3.0 cm	4.3 cm	5.4 cm	3.0 cm	5.4 cm
Housing Diameter:	0.5 cm	0.6 cm	0.6 cm	0.6 cm	0.6 cm
Top/Bottom End:	FLL/ML Slip	FLL/MLL	FLL/ML Slip	FLL/ML Slip	FLL/ML Slip
Available Irradiated:	YES	YES	YES	NO	NO

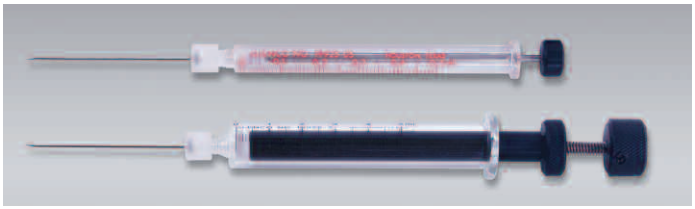
Ordering Information: DynaGard® Syringe Tip Filters

		Part No.	Description	Pore Rating	SA	Irradiated	Qty
Chromatography Disposables & Consumables	DynaGard® Syringe Tip Filters	DG2M-110-50S	ME for Aqueous filtration	0.2 µm	2.5 cm^2	YES	50/pkg
		DG2M-110-200				NO	200/pkg
		DG2M-23L-50S			3.4 cm^2	YES	50/pkg
		DG2M-23L-100				NO	100/pkg
		DG2M-330-50S			5.5 cm^2	YES	50/pkg
		DG2M-330-100				NO	100/pkg
		DG2P-110-200	PP for Organic Filtration	0.2 µm	0.8 cm^2	NO	200/pkg
		DG2P-320-100			3.9 cm^2		100/pkg

Glenco Gas/Liquid Syringes

Constructed with glass, PTFE and stainless steel for sample contact, Glenco Gas/Liquid Syringes are ideally suited for handling almost any gas or liquid. The flat plunger face found on both the fixed tension and adjustable tension plungers maximizes sample displacement. The syringes are available with replaceable needles as well as with fixed (cemented in place) needles. The removable needle syringes have a threaded tip (1/4" x 28 threads/in) for use with a variety of accessories.

The interchangeable plungers make replacing broken glass barrels economical. The adjustable tension plungers are ideal for storing samples in syringes. The tension can be tightened to hold the plunger in place for storage or transport and then loosened to add or remove sample. Adjustable tension plungers are available with either a fixed (cemented) needle or a removable needle (1/4" x28 thread/in tip).



Ordering Information: Glenco Gas/Liquid Syringes

		Syringe Type & Description	Part No.	Syringe Vol.	Syringe Grad.	Needle Dimensions (in) Length	Needle Dimensions (in) Size	Needle Dimensions (in) OD x ID	Qty
Glenco Gas / Liquid Syringes	Conventional	Gas/Liquid syringe with constant tension plunger and removable screw hub needle.	185190	50 µl	1 µl	2	22 G	0.028 x 0.006	1/pkg
			185549			3			
			185191	100 µl	2 µl	2			
			185551			3			
			185192	250 µl	5 µl	2			
			185553			3			
			185193	500 µl	10 µl	2	22 G	0.028 x 0.016	
			185554			3			
			185194	1.0 ml	10 µl	2			
			185556			3			
			185195	2.5 ml	50 µl	2	22 G	0.028 x 0.016	
			185390	5.0 ml	0.1 ml				
			185391	10 ml	0.5 ml				
			185392	20 ml	0.5 ml				
			185393	50 ml	1.0 ml				
			185394	100 ml	1.0 ml				
		Gas/Liquid syringe with constant tension plunger and removable blunt (flat-ended) needle.	185558	2.5 ml	50 µl	2	22 G	0.028 x 0.016	
		Gas/Liquid syringe with constant tension plunger and fixed (cemented in place) needle	185200	50 µl	1 µl	2	22 G	0.028 x 0.006	
			185201	100 µl	2 µl				
			185202	250 µl	5 µl				
			185203	500 µl	10 µl		22 G	0.028 x 0.016	
			185204	1 ml	10 µl				
			185205	2.5 ml	50 µl				
			185420	5 ml	0.1 ml				
			185421	10 ml	0.1 ml				
			185422	20 ml	0.5 ml				
			185423	50 ml	1.0 ml				
			185424	100 ml	1.0 ml				
	Adjustable	Gas/Liquid syringe with adjustable tension plunger and removable screw hub needle.	185210	5 ml	0.1 ml	2	22 G	0.28 x 0.016	1/pkg
			185211	10 ml	0.1 ml				
			185212	20 ml	0.5 ml				
			185213	50 ml	1.0 ml				
			185214	100 ml	1.0 ml				
		Gas/Liquid syringe with adjustable tension plunger and fixed (cemented in place) needle	185219	5 ml	0.1 ml		22 G	0.28 x 0.016	
			185220	10 ml	0.1 ml				
			185221	20 ml	0.5 ml				
			185222	50 ml	1.0 ml				
			185223	100 ml	1.0 ml				

Spectra/Gel® Ion Exchange Resin

Spectrum offers a complete range of Ion Exchange Resins for preparative scale chromatography, ideal for protein purification, antibody isolation, peptide fractionation as well as traditional inorganic ion exchange. Spectra/Gel® Resins are durable, insoluble and compatible with most aqueous and organic solvents. Select from the 3 cross-link ratios, 3 bead sizes and 2 ionic resin forms.

3 Cross-link Ratios Available

The structural polymeric backbone of the resin is styrene cross-linked with divinylbenzene. Higher levels of cross-linkage provide higher resin capacities and smaller molecular pore sizes. While they have little impact in inorganic ion exchange, pore sizes possess significant exclusion limits for globular proteins. Spectrum offers 3 cross-linkage types with corresponding capacities and pore sizes.

Cross-Linkage	Resin Capacity	Pore Size
2%	0.6 meq/ml	3,000 D
4%	1.0 meq/ml	1,500 D
8%	1.2 meq/ml	1,000 D

3 Bead Sizes Available

Spectrum offers 3 resin bead sizes, each providing a unique advantage for different chromatography applications:

Bead Size	Diameter	Application Type	Advantage
Small	40–75 µm	Pump Flow	Reduces plate height providing a more rapid equilibration at higher flow rates
Medium	75–150 µm	Pump Flow Gravity Flow Batch (non-flow)	One universal size for all types of applications
Large	150–300 µm	Gravity Flow Batch (non-Flow)	Ready-flow & easy separation from a bulk liquid

2 Ionic Resin Forms Available

The type of ion exchange performed depends on the charge of the functional groups covalently linked to the polymeric resin. Spectrum offers 2 ionic forms: negatively charged for cation affinity and positively charged for anion affinity.

Specifications:	Cation Affinity Exchange Resin	Anion Affinity Exchange Resin
Type:	Type 50 strong acid cation exchanger	Type 1 strong base anion exchanger
Active Group:	Sulfonic Acid	Trimethylbenzylammonium
Ionic Form:	H+	Cl-
Selectivity:	Ba++ > Rb++ > Ca++ > Mg++ > Be++ > Ag+ > Cs+ > Rb+ > K+ > NH_4+ > Na+ > H+ > Li+	I- > NO_3- > Br- > Cl- > OH- > F-
Moisture Content:	51–54%	43–48%

Ordering Information: Spectra/Gel® Ion Exchange Resin

		Part No.	Description	Capacity (meq/ml)	Cross Linkage	Bead Size (µm)	Mesh Size	Qty
Ion Exchange Resin	Cation	122000	Cation Exchange Resin, IE 50X2	0.6	2%	40-75	200-400	0.5 kg (1 lb)
		122005				75-150	100-200	
		122010				150-300	50-100	
		122025	Cation Exchange Resin, IE 50X4	1.2	4%	150-300	50-100	
		122030	Cation Exchange Resin, IE 50X8	1.7	8%	40-75	200-400	
		122040				150-300	50-100	
	Anion	122045	Anion Exchange Resin, IE 1X2	0.6	2%	40-75	200-400	0.5 kg (1 lb)
		122050				75-150	100-200	
		122055				150-300	50-100	
		122060	Anion Exchange Resin, IE 1X4	1.0	4%	40-75	200-400	
		122070				150-300	50-100	
		122075	Anion Exchange Resin, IE 1X8	1.2	8%	40-75	200-400	
		122080				75-150	100-200	
		122085				150-300	50-100	

This chemical resistance chart is intended for use as a guide, not as a guarantee of chemical compatibility. Variables in temperature, concentrations, durations of exposure and other factors may affect the use of the product. It is recommended to test under your own conditions.

The following codes are used to rate chemical resistance:

R = Recommended **L = Limited Exposure** **NR = Not Recommended** **U = Unknown**

	Cellulose Ester (CE) /Mixed Cellulose (ME)	Regenerated Cellulose (RC)	Polysulfone (PS) /Polyethersulfone (PES)	Polypropylene (PP)	Polyvinylidene difluoride (PVDF)
Acetic acid (diluted-5%)	L	R	R	R	R
Acetic acid (med conc-25%)	NR	R	R	R	R
Acetic acid (glacial)	NR	R	R	R	R
Acetone	NR	R	NR	R	L
Acetonitrile	NR	R	NR	R	L
Ammonium hydroxide (diluted)	NR	R	R	R	R
Ammonium hydroxide (med conc)	NR	L	R	R	R
Amyl acetate	NR	R	NR	R	R
Amyl alcohol	L	R	L	R	R
Aniline	NR	R	NR	R	R
Benzene	NR	R	L	R	R
Benzyl alcohol	NR	R	NR	R	L
Boric acid	R	R	R	R	R
Brine	R	R	R	R	R
Bromoform	NR	R	NR	R	R
Butyl acetate	NR	R	NR	R	R
Butyl alcohol	L	R	R	R	R
Butyl cellosolve	NR	L	NR	U	R
Butylaldehyde	NR	R	NR	R	R
Carbon tetrachloride	NR	R	NR	R	R
Cellosolve	NR	L	R	R	R
Chloroacetic acid	NR	R	NR	R	R
Chloroform	L	R	L	R	R
Chromic acid	NR	NR	NR	L	R
Cresol	NR	R	NR	R	NR
Cyclohexane	L	R	L	R	R
Cyclohexanone	NR	R	NR	R	L
Diacetone alcohol	NR	R	NR	R	R
Dichloromethane	L	R	L	R	R
Dimethyl formamide	NR	L	NR	R	NR
Dimethylsulfoxide	NR	R	NR	R	L
1,4 Dioxane	NR	L	L	R	R
Ethers	NR	R	NR	L	L
Ethyl acetate	NR	R	NR	R	R
Ethyl Alcohol	L	R	R	R	R
Ethyl alcohol (15%)	R	R	R	R	R
Ethyl alcohol (95%)	L	R	L	R	R
Ethylene dichloride	NR	R	NR	L	R
Ethylene glycol	L	R	R	R	R
Ethylene oxide	NR	L	R	R	R
Formaldehyde (2%)	L	R	R	R	R
Formaldehyde (30%)	L	R	R	R	R
Formic acid (25%)	NR	R	R	R	R
Formic Acid (50%)	NR	R	R	R	R
Freon®	R	R	R	R	R
Gasoline	R	R	L	R	R
Glycerine	R	R	R	R	R
Glycerol	R	R	R	R	R
Hexane	R	R	R	R	R
Hexanol	L	R	R	R	R
Hydrochloric acid (diluted-5%)	R	R	R	R	R
Hydrochloric acid (conc-25%)	NR	NR	R	R	R
Hydrochloric acid (conc-37%)	NR	NR	R	L	R
Hydrofluoric acid (25%)	NR	L	L	NR	R
Hydrogen peroxide (30%)	R	R	R	R	R
Iodine solutions	NR	NR	NR	R	R
Isobutyl alcohol	R	R	R	R	R
Isopropanol	L	R	R	R	R
Isopropyl acetate	NR	R	NR	R	R
Isopropyl alcohol	L	R	R	R	R

	Cellulose Ester (CE) /Mixed Cellulose (ME)	Regenerated Cellulose (RC)	Polysulfone (PS) /Polyethersulfone (PES)	Polypropylene (PP)	Polyvinylidene difluoride (PVDF)
Isopropyl ether	L	R	R	L	R
Jet Fuel 640A	R	R	R	R	R
Kerosene	R	R	R	R	R
Lactic acid	R	R	R	R	R
Methyl acetate	NR	R	NR	R	R
Methyl alcohol	L	R	L	R	R
Methyl alcohol (98%)	L	R	R	R	R
Methyl cellosolve	L	L	R	R	R
Methyl chloride	NR	R	NR	R	L
Methyl ethyl ketone	NR	R	NR	R	L
Methyl formate	NR	L	NR	R	R
Methyl isobutyl ketone	NR	R	NR	R	L
Methylene chloride	L	R	L	R	R
N-methyl-2-pyrrolidone	NR	R	NR	R	R
Mineral spirits	R	R	R	R	R
Monochlorobenzene	L	R	NR	L	R
Nitric acid (diluted-5%)	L	R	R	R	NR
Nitric acid (med conc-25%)	NR	NR	R	R	NR
Nitric acid (6N)	NR	N	R	L	R
Nitric acid (conc-70%)	NR	NR	NR	NR	NR
Nitric acid (concentrated)	NR	NR	R	NR	L
Nitrobenzene	NR	L	NR	NR	R
Nitropropane	NR	L	NR	L	R
Oils, mineral	R	R	R	R	R
Pentane	R	R	R	R	R
Perchloric acid (25%)	NR	L	NR	NR	R
Perchloroethylene	NR	R	NR	L	R
Petroleum based oils	R	R	R	R	R
Petroleum ether	R	R	R	R	R
Phenol (0.5%)	R	R	R	R	R
Phenol (10%)	NR	R	L	R	R
Phosphoric acid (25%)	NR	L	R	R	R
Potassium hydroxide (1N)	L	L	NR	R	R
Potassium hydroxide (25%)	NR	R	R	R	R
Potassium hydroxide (50%)	NR	NR	R	R	R
Propanol	R	R	R	R	R
Pyridine	NR	R	NR	R	L
Silicone oil	R	R	R	R	R
Sodium hydroxide (0.1N)	L	R	R	R	R
Sodium hydroxide (diluted-5%)	NR	L	R	R	R
Sodium hydroxide (25%)	NR	L	R	R	R
Sodium hydroxide (conc-50%)	NR	NR	R	R	R
Sodium Hydroxide (conc)	NR	NR	R	R	R
Sodium hypochlorite	NR	NR	NR	L	L
Sulfuric acid (diluted-5%)	L	R	R	R	R
Sulfuric acid (med conc-25%)	NR	L	R	R	R
Sulfuric acid (6N)	NR	L	R	R	R
Sulfuric Acid (conc)	NR	NR	R	NR	L
Tetrahydrofuran	NR	R	NR	R	R
Toluene	R	R	L	R	R
Trichloroacetic acid (25%)	NR	NR	R	R	R
Trichlorobenzene	NR	R	NR	R	R
Trichloroethane	L	R	L	R	R
Trichloroethylene	R	R	R	R	NR
Triethylamine	NR	R	NR	L	R
Turpentine	NR	R	NR	R	R
Urea	R	R	R	R	R
Urea (6N)	NR	R	NR	R	R
Water	R	R	R	R	R
Xylene	NR	R	NR	R	R

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Part Number Index

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